NATURE MAGAZINE

November, 1942 35 Cents Vol. 35, No. 9

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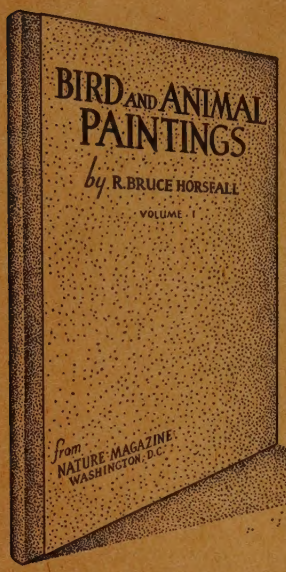

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Have you not often wished for an accurate source of information about the name of a bird or animal or insect? On a walk, a camping trip, or while exploring new country, how often arises the question "What is it?" An animal flashing through the underbrush or scampering across the trail instantly arouses one's curiosity. For lovers of nature who wish to become familiar with the various species of wild life in this country, we offer a valuable aid and a genuine bargain in this book.

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by R. Bruce Horsfall

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Despite the high cost of color plates and printing, this beautifully printed, 58-page book, with its many pictures, is offered to readers of Nature Magazine at only $1.50 a copy. Send your order with remittance to

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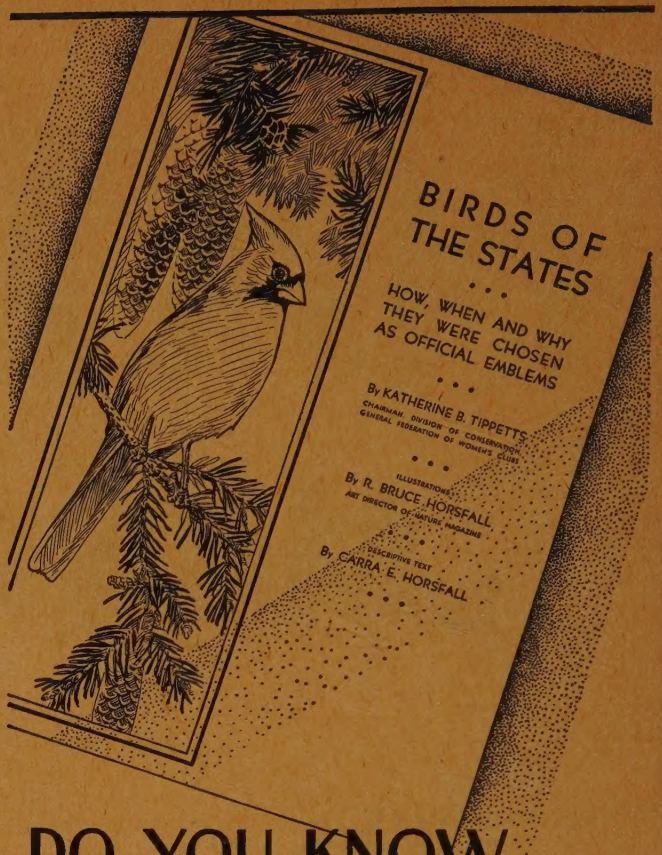
BIRDS OF THE STATES
HOW, WHEN AND WHY THEY WERE CHOSEN AS OFFICIAL EMBLEMS
By KATHERINE B. TIPPETTS
ILLUSTRATIONS By R. BRUCE HORSFALL
DESCRIPTIVE TEXT By CARRA E. HORSFALL

DO YOU KNOW The Bird of Your State?

or of the 42 other states that have adopted official birds?

The movement to select an official bird emblem for every state only recently was launched as a nation-wide movement. Some of course had adopted official birds earlier. Altogether, 43 states have now selected a bird to represent them as an emblem.

The fascinating story of how, when and why the various states selected the birds to represent them is told in this book by Katherine B. Tippetts, former Chairman of Conservation, General Federation of Women's Clubs. Illustrating the book are 30 full color paintings of the various birds by R. Bruce Horsfall, the famous wild life painter, with descriptive text by Carra E. Horsfall.

Every home and every school should have this book. It is a fascinating bit of history combined with an authentic and interesting survey of the birds of America. A handy table in the front lists the birds together with the official flowers of the states.

The 16-page book, with 30 illustrations, is offered to readers of Nature Magazine at 25 cents a copy. On orders for ten or more copies, the price is 10 cents a copy.

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Somersault

"A most brilliant 'somersault to success' since Pearl Harbor has been accomplished by the NATURE MAGAZINE published by the American Nature Association 'to stimulate public interest in every phase of Nature and the out of doors, and devoted to the practical conservation of the great natural resources of America', Arthur Newton Pack, editor." So says the *Honolulu Star-Bulletin* of August 8, adding:

"Not that there has come about a change, so much as an intensification, of policy. Smoothly the gears of the publication have lifted it in a matter of weeks out of the rut of a somewhat gentle seasonal routine of context and presentation suitable for professor and student of botanical, zoological leanings. Firmly have its wheels of organization and talent stepped up in tempo, forged ahead on a highway of generally expanded, informative and useful reader interest."

We are deeply appreciative of these kind words, which are followed by citation of several of the recent articles relating Nature's gifts to the needs and problems of our country today. We may have been gentle, except on conservation issues, and we hope we were really not in a rut. However, these words of comment are a fitting prelude to brief mention of some of the physical changes found in the current issue.

The cover has been redressed for more appeal, although we have not deserted the durable and distinctive cover paper that permits the magazine to stand up under the continued and considerable use it gets in home, school and library. We have adopted a new and readable text face, selecting Bodoni, leaded for added readability. For the narrow-measure matter in the front and the back of the magazine we have chosen larger type for the same reason. To the illustrations we are giving larger size where they deserve it, and have otherwise "redressed" the magazine in consideration of the eye comfort of our readers. We hope you like it.

Binoculars Needed

Word comes from Bausch and Lomb that disappointing results have come from the United States Navy's appeal for binoculars. Some 6000 offers have resulted from the appeal and only 1675 acceptable types obtained. In World War I 51,217 glasses of all types were offered and 31,000 accepted. The desired types are Bausch and Lomb and Zeiss 6X 30 and 7X 50 models because facilities are available to keep them in repair. The need for the glasses is great, and although manufacturers are making as many binoculars in one month as they formerly made in a year the demand cannot be supplied. Many other vital war needs are taxing plant capacity, so it is up to those who have the required types to rally around. Civilian binoculars loaned to the Navy will save lives and ships.

About Bezoars

Bezoars or stomach stones are found in a variety of mammals, chiefly ruminants. Those of the limy type have been reported also from the American muskrat. They are formed about some indigestible particle and are added to layer by layer; thus they show a concentric structure when sectioned. The name is derived from Persian words meaning "protecting from poison" and formerly these stomach stones had quite a repute in medicinal practice in Oriental countries. When there was a trade in them, bezoars were classified as to source under the following names: Oriental bezoars, composed mostly of resinous matter from the stomachs of the goat and gazelle in Asia Minor and adjacent areas; Western bezoars, calcareous in nature, from stomachs of South American llamas; and German bezoars, composed chiefly of hair and vegetable fibers from the gemsbok and other African antelopes. The latter type of bezoar is obtained from the stomachs of deer and cattle also, and even in this country these hair balls formerly were thought to draw out the poison when applied to bites of mad dogs or venomous snakes; they were known as madstones. However, modern medical practice ignores the alleged valuable qualities of bezoars, and these objects, while of interest, have no commercial value.

Devil's Shoestring

East Texas farmers, exasperated by the tough, long, slender shoots of a weed plant on their land, called it "devil's shoestring" and determinedly grubbed it from their fields. Now U. S. Department of Agriculture entomologists find that it is a superior source of rotenone, one of the best insecticides for controlling the insect pests of certain crops. The plant is known by the scientific name of *Tephrosia virginiana*, and experimental plantings are being made using seedlings selected for their superior content.

MOTHER OF 4 EARNS $1,000 ON HER WRITING

"Without jeopardizing our home life a bit, I have been able to earn $1,000, since graduating from N.I.A. If I had not the responsibility of four small children, home duties, haphazard health and war work, I am sure I could have made much more. After only two lessons, I sold a garden series to Baltimore American. The N.I.A. way makes writing child's play."—Gladys Carr, Annapolis, Md.

How do you know you *can't* write?

Have you ever tried?

Have you ever attempted even the least bit of training, under competent guidance?

Or have you been sitting back, as it is so easy to do, waiting for the day to come when you will awaken all of a sudden to the discovery, "I *am* a writer"?

If the latter course is the one of your choosing, you probably *never will write*. Lawyers must be law clerks. Doctors must be internes. Engineers must be draftsmen. We all know that, in our times, the egg does come before the chicken.

It is seldom that anyone becomes a writer until he (or she) has been writing for some time. That is why so many authors and writers spring up out of the newspaper business. The day-to-day necessity of writing—of gathering material about which to write—develops their talent, their insight, their background and their confidence as nothing else could.

That is why the Newspaper Institute of America bases its writing instruction on journalism—continuous writing—the training that has produced so many successful authors.

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Many people who should be writing become awe-struck by fabulous stories about millionaire authors. Therefore they give little thought to the $25, $50 and $100 or more that can often be earned for material that takes little time to write—stories, articles on business, hobbies, travels, sports, news items, human interest stories, civilian defense activities, war work, etc.—things that can easily be turned out in leisure hours, and often on the impulse of the moment.

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Camera Trails

By Norris W. Harkness

What Shall I Photograph?

A high school student in Pennsylvania writes: "I am very much interested in Nature work and follow NATURE MAGAZINE carefully each month. Now I have become interested in photography and have a good camera and darkroom equipment which I am beginning to use fairly well. The big question is this—'What shall I photograph?' I want to concentrate on Nature pictures."

He has taken up photography as a hobby for the fun and pleasure it will give him. To gain most from his camera he must accomplish two things—he must get good enough results to please himself and those to whom he shows the pictures; and he must photograph those things that most interest him. The first demands that he learn as much about every part of photography as he can and then practice enough to do good work. The second will change from time to time, and he will probably shift his attention from marines, through landscapes and portraiture, to table-tops. In Nature photography he will get excited about trees, moths, birds, insects—any of the innumerable subjects that appear in the pages of NATURE MAGAZINE every month, but he undoubtedly will concentrate first on one and then on some other.

The important thing for him, and for all of us who are photographers for the fun of it, is to follow the desire of the moment and to keep on doing pictures of whatever seems most exciting and attractive when we are ready to go out with the camera. Solving some of the problems we encounter will take stick-to-it-iveness if we are to get the best from the adventure, but making each new direction we take a new and thrilling adventure will keep our interest fresh and our photography worth doing.

In a word, the answer to the question, is just this: Make the kind of pictures you want to make of whatever subject matter you please, but remember that you will get the results you want only if you are really interested in what is before your camera and if you really know something about that subject matter. You have become a photographer, a Nature photographer, for fun. Get all you can from it.

•

Taking Nature Movies

Frank E. Gunnell is the outstanding nature photographer of New York's largest and most progressive amateur motion picture group, the Metropolitan Motion Picture Club. His work has ranked high in the annual Best Ten contests of the Amateur Cinema League and his list of prizes is gratifyingly long.

For suggestions to all Nature movie makers I cornered him at the opening meeting of the Met Club's year and asked him for a message that might help the beginner at Nature movies. Mr. Gunnell is a teacher of mathematics in a junior high school, and his work is done whenever he can get away from his regular duties. His photography began with the purchase of a movie camera after a 13,000 mile trip around the country in 1929, and his favorite pastime is still making movies, although he also does much still work.

He began with a simple camera and kept trading

"Gliders" **By Lloyd G. Miller**

in the old one for more versatile equipment until he now uses for most work a Ciné Special. Along with it he carries a Filmo Auto-Load Magazine camera which he bought after two trips with the Special up and down the Grand Canyon, but because of its greater flexibility he uses the Special whenever the portability problem is not too bad.

Mr. Gunnell has found that the greatest interest was shown in the films of birds and animals, and he then set out to make Nature pictures. Mrs. Gunnell knew birds (they both do now) and helps him to locate nests and acts generally as his assistant, but, especially in strange territory, they consult the Park Rangers and others familiar with the local bird and animal life.

Together they expose far less film for the amount that actually reaches the screen than almost any movie makers I know. It frequently happens that good picture material is passed up because the conditions are not right for good results and no film is exposed unless there is every reason to believe that the pictures will look as they should when projected. The result is that a badly-exposed film is rare.

I asked Mr. Gunnell what he would tell me if I came to him with the question: "I have a movie camera and I want to make the kind of bird and animal pictures that you show. How do I begin to do that kind of work and what is your advice?"

He grinned and said, "I have been working on that for twelve years and it is just beginning to come along. The first thing I would do is to study the camera thoroughly and master the exposure question on scenes that can be repeated. Learn about the depth of field at any stop and any distance and become a good judge of focusing distance. The most frequent fault with most films is unsharp focus, especially when the working distance is short. Get to know your lenses and keep shooting until the actual operation of the camera is automatic. Then, when you are on trips, ask plenty of questions about local conditions and wildlife from the people who really know. At home team up with a naturalist if you are the photographer, or with a camera man if you know Nature subjects. Then watch for your opportunities and always be ready to shoot. Get the important action whenever it happens, but don't forget to shoot enough background material to make the real Nature scene fit into the story your film is to tell. Edit the results carefully, make plenty of titles, and be prepared to show only the footage that has something to say and says it well technically. There is

no better fun in all of photography than the pleased acceptance of your work by an audience."

I have seen several of Mr. Gunnell's films. If you could see them too, you would realize that his advice must be good.

•

This and That

One of the most important events of the 1942-43 camera season are the Red Cross Awards mentioned here last month. More details of the contest are now available. The Awards are open to any American except those on the Red Cross payroll. Prints should not be larger than ten inches on any side, nor smaller than five by seven, and they should illustrate either the work of the Red Cross or the spirit behind it. There are no entry blanks. It is only necessary that you print lightly your name and address, together with the title or any caption material, on the back of each print and mail it to The Red Cross Awards, 598 Madison Avenue, New York City. The Awards will be split into three sections in October, November, and December with the closing date for each section at the end of that month.

The winners of any of the 36 prizes each month will be entered in the grand final judging to take place in January, and the 122 winners will divide a maturity value of $5125 in War Savings Bonds. The top prize each month is a $200 bond, and the Grand Prize is one of $500.

That side of the contest is important, but it means less to the individual photographer than does the opportunity to make story-telling camera documents concerning an outstanding American institution. It is the amateur's biggest opportunity to do the world's best job of picture education—the sort of job that will show every American what happens to his membership dollar and what good it does. If we carry out the assignment, with each of us doing his best, the next membership drive for the Red Cross will find the collectors hiding behind trees to escape the flood of money hurled at them. Get busy on it in your own chapter. There can be no finer cause or photographic opportunity.

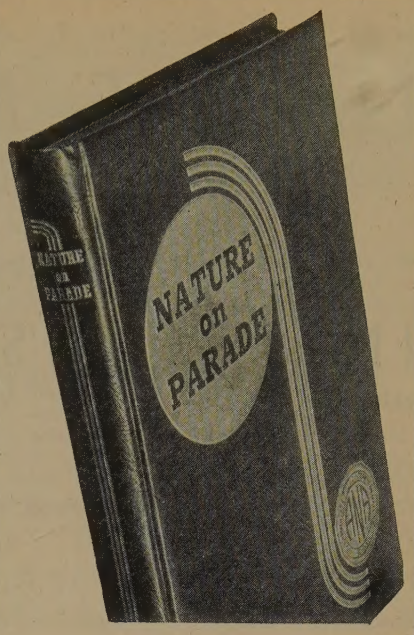
If you wait until the first of next month to start making your Christmas cards, you will probably find that you have trimmed your time so closely that you cannot get them ready in time. Then, too, you will probably prefer to use the regular card size of paper and envelope and if you do not order them early you are not likely to get them.

Go through your negatives now and look especially in the crop you made at Christmas last year—or did you remember to make them? Pick out the one that says just what you want to tell your friends and then check the greeting. You can use one of the commercial card outfits, or either copy the greeting yourself or have your local photographer do it for you. Tell him you want the most contrasty negative possible and give him the exact size. Then combine the greeting and the picture negatives in a mask and go ahead with the prints.

But make each one the very best you can turn out. Your skill as a photographer will be judged by the card you send.

A movie of the family's Thanksgiving celebration will make a valuable permanent record, and, with a little thought and preparation beforehand, it is not hard to do. Two or three Number Two flood bulbs in reflectors, a tripod for the camera, and an idea are the most necessary elements. The idea matters most. Plan to start with the setting rather than with the actual beginning of the gathering. Get short shots of the preparations for the dinner and the house-cleaning that always seems to precede the arrival of the first guests. Then show each one as he arrives, greeting Mother and the like. Stage the shots, of course, but make them look unstaged and unposed. Those shots can all be made outdoors, but the dinner naturally will need to be done with the lights in the dining room. Select a high viewpoint at a position that will let you show everyone with the least possible movement of the camera and then photograph the family while they are doing anything except looking at you and the camera. Be sure everyone is included, but try to get several in conversation at once rather than make separate shots of each of them. Then edit the film carefully and you will have something you will always be grateful for.

Be sure not to sweep the darkroom as you clean it after the summer lay-off. Sweeping and vigorous dusting stir up chemicals that have dried in the past and make spots on negatives and prints. Dust gently with a damp cloth and mop floors, but be sure the shelves and box tops are as clean as you can get them. Dirt in the darkroom is a constant cause of trouble and can cost much in wasted materials.



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NATURE MAGAZINE

PUBLISHED BY THE AMERICAN NATURE ASSOCIATION

To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

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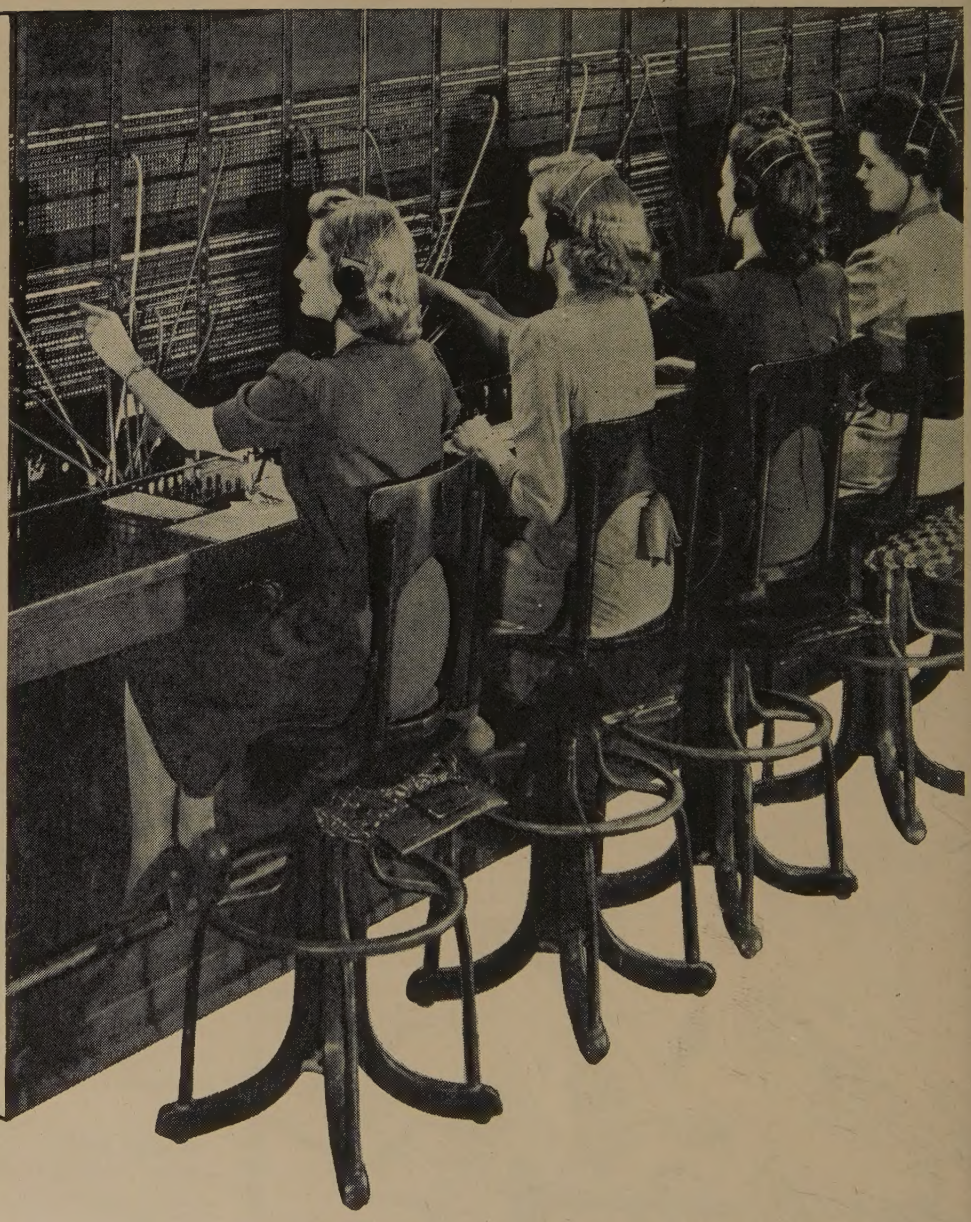


We can't get materials to build enough of them. And those we have now are crowded with war calls.

So please do not make Long Distance calls to centers of war activity.

These girls are at battle stations on the telephone front. They have as much as they can do to get the war calls through.

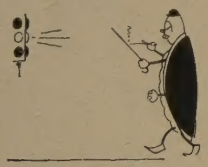
BELL TELEPHONE SYSTEM

WAR CALLS COME FIRST

Contents Noted

In these times we find particularly comforting the receipt of a batch of reports from the Proceedings of the Biological Society of Washington. They include Some Notes on the Taxonomy of Grain Mites. (Acarina: Acaridae, formerly Tyroglyphidae); descriptions of Five New Asteraceae from Oaxaca; information on Nomenclatorial Changes in Glossopetalon (Celastraceae), and other odd but doubtless scientifically important items. It seems to us that so long as men will continue, in the face of war and disintegration, to classify and keep up to date the floral and faunal roster we may renew confidence in fundamental sanity and faith in the future of the human race.

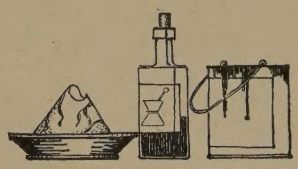
Not inappropriately, Japanese beetles prefer yellow. Government entomologists and DuPont research chemists have found this out through beetle trap experimentation. In Maryland pest investigators had a season's catch of 1737 barrels, or 104 tons, of beetles from 100,000 traps. The yellow ones out-captured the green and white ones by 50.8 per cent. Nevertheless, the beetles do not appear intimidated by the uniformly green color of what they eat in our garden.



The slogan selected for American Education Week, that runs from November 8 to 14, is "Education for Free Men." It is a phrase worth thought, and while we are restrained in our enthusiasm for "weeks" to observe things so vital as our educational system (which calls for year-round vigilance and interest) we hope that American Education Week will serve to carry the meaning of its slogan home to all Americans. As a parent and citizen we will try to contribute our part, and hope you will, too.

Nobody has attempted anything like an accurate count of the assorted birds and small mammals that have fallen victim to the speeding automobile in past years. The frequent crumpled and crushed bodies, and the pungent odor of deceased but not departed skunk, have been sufficient evidence that the loss is tremendous. Authorities now predict that the toll will drop off sharply due both to the fewer cars travelling long distances over the rural highways and the lessened speed prescribed by law and thin tires. Particularly at night the automobile is a deadly weapon to animal life, the blinding lights and swooping speed confusing them into panic and disaster.

No day passes without its emphasis on man's dependence on Nature for a multitude of things he has come to accept as essential in his life. In Massachusetts, for example, there is a boom in the business of collecting carrageen, or "Irish moss". This a gelatinous submarine growth, which, dried and bleached, goes into puddings, pharmaceutical supplies, skin lotions and many other products. Powdered, it is used in paints, medicine, confectioneries, shoe blacking and ice cream. Imports of carrageen being cut off, we can thank Nature for providing a domestic cache. Similarly, we used to import sponges from Japan for use as oil filters in the engines of ships. Now it is found that the fibrous, spongy material inside the common loofah or dishrag gourd of southern dooryards does the trick equally well.



We feel a certain envy for Charles Flint of Tunbridge, Vermont. In his family there are eight persons, whose masticatory equipment adds up to two hundred and fifty assorted molars, bicuspids and whatever else the dental fraternity calls those sources of aches and decay. In Mr. Flint's pig pen there is an annual litter. From this he gives a lusty well-fed porker to one Dr. Sowles, dentist at nearby Randolph. In return all the Flint teeth are given expert care, and both parties to the deal are reported highly satisfied. We have always had a lurking suspicion that there was more to this business of barter than the eye perceives and economists concede. But one year's subscription to Nature Magazine would, we fear, get us little more than a few jabs with the drill and a gutta-percha plug.

R. W. W.

Milkweed has a little rubber in its sticky juice; fiber of a sort in its stem. Nutritionists praise it for its vitamins. More important, its silky seed floss will float a life preserver. Recently a milkweed gin was set up in Michigan and $200,000 is being spent to buy pods to feed it. In 1943 much milkweed is likely to be planted. Photograph by Minnie May Johnson.

Plants in a World at War

This article by Dr. Stanford, a leading authority on economic plants, is another in *Nature Magazine's* series, specially prepared for our readers, emphasizing the vital role that Nature and our natural resources play in the war we are waging for preservation of the democratic way of life.

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By E. E. STANFORD

SHOULD a nation sustain itself? There are economists and politicians—even statesmen—who argue that in a properly regulated world no nation should produce all its own necessities. The world, they say, should be one community. Tropical nations should stick to sugar cane and coconuts; northern realms with coal and iron and limestone should specialize in manufacture. Interdependence builds commerce, leads toward unity, toward a world with diverse parts functioning for the common good; an integrated global structure like a living human body.

Yet, in the world we know, reliance on a far land for one indispensable such as rubber, for example, may, and does, threaten our national existence. We Americans used to think we "had everything"—or something just as good. Now, every day we are up against new shortages that hurt. Rubber is not the only necessity lost—for the time—in the tropical Orient. A miscellany of plant products, some tropical, some not, present problems of production, distribution, conservation, and substitution in our war effort.

While steel and copper, aluminum and magnesium play major roles in modern warfare, "Man's best material—wood" is far from being obsolete. In 1941, the Department of Commerce says, about 73 per cent, or 23,000,000,000 feet, of our lumber production went directly or indirectly into war work. Old uses multiply their demands, new ones spring up daily. (See "Rediscovered Wood," Nature Magazine for October, 1942.)

From huge redwoods comes a rusty-brown, woolly material for insulation, and attempts are being made to adapt its fibers to mixture with wool for textiles. Photograph by Gabriel Moulin.

Many trees are valued for their wood, but few are prized for what grows outside it. Some barks are used for tanning raw hides into leather. In Colonial days available hemlock and oak located the American tanning industry in New England. Boston is still a world leather center. Oak and hemlock became scarcer. Barefoot boys became prosperous men whose children's feet were shod twelve months in the year. Chemists took a hand in the tanning problem, and the metal chromium became parent of a material that hardened something like one half of America's leather.

While the Oriental chestnut blight devastated hundreds of square miles of Appalachian chestnut, wood tanning extract has been a principal salvage from the dead trees, creating a temporary industry. In recent years, chestnut has supplied about half of our vegetable tannage. Strange-named tropical products come half around the world by water to Massachusetts tanneries—mangrove bark from Borneo and East Africa; wattle bark from Africa; a fruit, myrobalan plums, from India; valonia acorn cups from Asia Minor; divi-divi pods, *Caesalpinia,* and hard red quebracho wood from South America; sumac leaves from Sicily. War has severed us from some of these, and other essentials clamor for such shipping as we can spare for Latin America. Steel for machines and munitions calls insistently for chrome. Whatever happens to the rest of us, an army of ten million men will need a lot of shoes. So leather chemists and research institutions are probing the possibilities of products like domestic sumac, Mexican dock roots, native mangroves fringing brackish Florida swamps, and the huge forests of western hemlock.

The most famous bark in the world is that of the Mediterranean cork oak. For more than two thousand years this uniquely light and resilient material has served human needs. In peace, a few of its uses are in linoleum and cork carpets; insulation for refrigerators, steam pipes and buildings; gaskets and oil seals for motors. In war, cork makes life preservers and sweat preventers for surface craft and submarines. It cuts vibration in airplanes and tanks. It makes cartridge plugs and plays an unadvertised part in bomb construction. While "cork leg" is something of a misnomer, cork has its surgical uses.

Portugal and Spain provide about two-thirds of American cork imports. Early in 1941 the bulky product of the cork tree was listed as a "critical material" and the stringency of supply has by no means lessened. An intensive campaign now urges buyers of certain beverages to "Buy quarts" to conserve cork and the metal of caps.

Like many curious exotics, the cork oak has been planted in America. It is too frost-sensitive for the North and is rather rare in the southern states. In 1858, and again in 1880, a few Spanish cork acorns were planted in California. A somewhat larger planting was made in 1904. A rather extensive study published in 1929 by the State Department of Agriculture led to the conclusion that California costs of production, particularly labor costs, were too high to compete with the Mediterranean world.

Now, the whole problem of American cork supply is being restudied. Several Brazilian barks are used as cork-substitutes in South America, but importers in the United States think poorly of them. Cork occurs in the outer bark of many American trees, but generally in small quantities intermixed with less useful elements. The beauty of the white birch lies in cork-layers, thin, easily torn, useful only to Indians and artists. We have nothing like the broad sheets of bottle-stopper cork, but to supplement diminishing supplies of powdered and granulated cork, grinding and sifting processes may perhaps be devised to separate corky cells of American trees from their natural mixture with fibers and little bits of woodiness. The Forest Service is investigating cork potentialities of corkbark fir, Douglas fir, and white fir in Washington and Arizona. California cork oaks have been stripped. The bark proves to be of excellent quality for granulation, but its quantity is in truckloads rather than shiploads. New plantations are being established in California; if the work is to be measured in thousands of acres rather than thousands of trees, America may become self-sustaining in cork—twenty years from now.

If most barks are corky, at least as many are fibrous, but usually to no benefit save to the tree. Outer portions of a few smaller plants—flax, hemp and jute, for example—yield valuable textile material, but fibers of most tree-barks are inextricably mixed with woody cells, cork, tannin, pitch and what-not. From huge redwoods, however, comes a rusty-brown, woolly material for insulation, and Pacific Coast lumber people are trying to adapt its fibers to textile mixture with wool.

The war has caused profound dislocations in the commerce of textile and cordage materials. Uncle Sam is by no means at the end of his string, but he is, one might say, walking a tight rope. Principal plant fiber materials are cotton and linen for fine fabrics; jute for burlap and cheap twines; sisal and henequen for cordage of medium grade; abacá or Manila hemp for the best marine ropes and hawsers.

Of all these materials, the continental United States is self-sufficient in cotton alone. Rayon, which is plant-made cellulose reformed by man, is also in abundant supply. For the rest, we depend on other parts of the world, most of them remote. In recent years, we have had far too much cotton. Its price, although supported by crop loans and acreage restrictions, has been ruinously low. Agricultural, sociological, and economic effort have wrestled to break the stranglehold of King Cotton on the Old South, the Cotton Belt. In spite of all this, in August, 1941, the Commodity Credit Corporation held more than 6,000,000 bales of cotton taken on crop loans of previous seasons. Many cotton experts had predicted no better end for this than a huge bonfire. Even before Pearl Harbor, how-

ever, the vast pile had begun to melt into uniform cloth and other heavy materials, bandages, and guncotton. Some 1,500,000 bales of it were permitted export at approximately 75 per cent of the market price. Much of this went to Canada to replace still-cheaper Brazilian cotton. In the United States, 1941 saw an all-time high production of cotton cloth, and unless military stringency forces abandonment of many consumer items, the present year should surpass that.

At least one valuable result came from a decade of generally disastrous cotton production. More than 60 per cent of American cotton of the first World War period was of very short staple—its fiber was less than an inch long—and so was unsuitable for the heavy-duty fabrics of warfare. During these latter years plant breeders, statisticians, economists, sociologists, cotton experts, and textile men and farmers focused their diverse trainings on producing not more cotton, but better cotton. In the crop of 1941, the proportion of shortest-staple cotton had dropped to 12 per cent. The predominating length was $1\frac{1}{32}$ inches, and long staple—longer than that—had increased 50 per cent. All this means better tents and tropical uniforms for the armed forces; better potato and onion sacks for the American farm; better sand-bags for the American home and factory.

If our colonial forefathers came ashore with a gun in one hand they brought seeds in the other—among them, seeds of flax and hemp. Flax fiber was for linen sheets and linsey-woolsey clothing; hemp for ropes—ropes to bind witches and other malefactors; ropes to rig ships that bore fish, timber and tobacco to Old England. In dusty New England attics may still be found cobwebby hanks of flax tow and flax line. Flax wheels have mostly gone to museums, while less romantic implements of retting and scutching—fiber separation—have pretty generally disappeared.

Economic changes, started by Eli Whitney's cotton gin, made short work of seaboard fiber flax production. Climate was not too good for it, and the plant just did not fit into a machine-farming age. For years, the U.S.S.R. and adjacent small Baltic countries have provided more than 80 per cent of the world's fiber flax; some comes from Ireland, Belgium and the Netherlands. We have imported coarse flax fiber for weaving, but our fine linen goods came wholly manufactured from abroad, to the tune of $25,000,000 annually. Only in Oregon is there a limited renaissance of fiber flax. A pioneer of Oregon's first overland caravan made homespun garments from flax planted in 1844. Samples of Oregon flax won a medal at the Centennial Exposition at Philadelphia in 1876. But its modern development dates from 1915, when the Oregon State Board of Control assumed charge of a project intended primarily to establish a prison industry by having Willamette Valley farmers raise flax to be processed in the State Penitentiary at Salem.

Principal obstacles lay in the facts that fiber flax is pulled rather than cut, and that pulling as well as later operations were laboriously done by hand.

A field of hemp in Kentucky, which state shares with Wisconsin the distinction of producing almost all our domestic hemp. For imports we depended on Russia and Italy. This year emphasis is placed on seed production for which such fields as this must be allowed to become over-ripe for fiber use. In 1943, thousands of acres will be planted for fiber. Photograph from Kentucky Agricultural Experiment Station.

Abacá, the best fiber for ropes and heavy hawsers, comes from the stems of a Philippine tree-like herb, *Musa textilis*. Since the events of December, 1941, closed off this source of supply, we are stimulating abacá cultivation in Panama and Costa Rica. Possibly, and probably, crudely-designed native presses still bale the lustrous abacá in the Philippines—but for the Japanese. Photographs from the Philippine Bureau of Science.

Eventually, however, American ingenuity got the flax out of hand into machines. Henry Ford, who is at present busy about other matters, was at one time interested in the mechanization of flax. Flax is now pulled by ingenious devices drawn by tractors. Separating the long linen fibers from the refuse of the stem is done now not only in the prison, but by several successful farmers' cooperatives and at least one privately-owned plant. Flax fiber is handled in part by local spinning mills. Spun yarns go mostly into threads, fishing lines, and warp-yarns for weaving. Thus far, not much weaving has been done in Oregon. In 1941, the State produced 11,500 acres of flax; in 1942, 19,000 acres were sown. Granted price stimulus and sufficient labor, larger plantings could supply America's whole demand for linen cordage and coarse fabrics. Fine linen is another matter. To produce that would require not only a different technique of fiber production, but peculiarly skilled labor and a sort of machinery in which the United States is wholly lacking.

One enormously important textile that India has virtually monopolized is jute. This is coarse golden-brown fiber from the bark of tall tropical herbs related to our basswood trees—which trees, incidentally, furnished aboriginal peoples with coarse cordage. Jute is the combined product of the cheapest labor and damp rich soil steaming under a tropical sun. Experimental plantings in the United States have done poorly. Small-scale success has been reported from Brazil, where Japanese colonies (consisting, one gathers, of military and naval personnel as well as dirt farmers) have tried jute out.

Burlap, the coarse cloth woven from jute, comes mostly from India and Scotland, although San Quentin Prison in California has produced it for agricultural sacking. Carpets, rugs, and linoleum are based on a hidden webbing of jute. Bales of its more expensive rival, cotton, go to market in a coarse network of it. Brown parcel-post twine is usually of jute. Cotton competes in many of these uses when the price-differential is not too great, and it looks as though it might have to pinch-hit in our present game until the Japanese side is retired.

The so-called hard fibers that make rope are almost wholly tropical. Sisal and henequen are coarse white strands from huge pulpy leaves that grow on stumpy Mexican desert plants like the century plant. Henequen, the great binder-twine fiber, has not done well elsewhere, but more adaptable sisal now comes also from East Africa and Haiti, and we used to get a lot of it from Sumatra and Java. Glistening white cordage, clothesline, and the less expensive grades of rope are usually of these fibers. Most prized of all vegetable rope-materials, however, is abacá or Manila hemp, combed from the leaf-bases of an inedible banana plant of the Philippines. Abacá is strongest of vegetable fibers. It swells little when wet, and is especially valued for hawsers, ship's cables, riggings, well-drilling and hoisting ropes. Destroyers do not spread sails, but every one of them calls for

some 11,000 feet of rope, and bigger ships need more. Routine specifications for Army and Navy cordage called for abacá as a matter of course. For months this fiber has been as carefully husbanded as rubber. Non-governmental users are getting sisal—which is about four-fifths as strong as abacá—and other less desirable substitutes and mixtures thereof. Cotton rope, which has little more than half Manila's strength, is one.

Abacá was one of the great Philippine agricultural specialties. For years, exportation of seed material has been prohibited. Before this attempt at monopoly, however, a small cultivation had become established in Panama. Our government is stimulating production here and also in Costa Rica. Ecuador is anxious to get into the abacá game; that country might raise half as much as we used to get from the Philippines.

While tropical hard fiber cannot be raised in the United States, the Old World soft hemp, which preceded it in rope-making, is coming back in a big way. A century ago, considerable hemp was grown in the United States. Since then its culture has seen bitter days. Abacá, henequen, sisal, and jute replaced it for most purposes. A good crop requires rich soil—preferably river-bottom—in which other crops generally pay better. The plant has narcotic properties; it is the source of the nefarious marihuana. To curtail production of this, Congress in 1937 passed an act requiring Federal license for the culture of hemp. Most of our small demands for its fiber have been supplied by Russia and Italy. Thus American hemp culture became almost extinct save in Wisconsin and the Bluegrass region of Kentucky.

Among non-textile fiber scarcities is kapok—the pillow and sleeping bag stuffing, the mattress material of which there was too much on the *Normandie*. Kapok is not coming from Java any more. The Navy Department wants at least a million pounds of something like it for mattresses, life preservers, and rafts. Miles and miles of eastern meadowland are splattered and rimmed with milkweed. Milkweed has been getting quite a bit of publicity. There is a little rubber in the sticky juice; fiber of a sort in the stems. Fifty years ago, anybody's grandmother knew milkweed was good-for-what-ails-you as spring greens; now nutritionists praise its vitamins. None of these assets will float a life-preserver, but the silky seed floss can. Recently, the first commercial milkweed gin was set up in Michigan, and $200,000 of Government money is being spent to buy milkweed pods to run through it. Nobody seems to have planted milkweed yet, but in 1943 a good many somebodies probably will.

To win a war, of course, we need more than timber, tannin, cork and textiles. We need food. Years ago we talked about foodstuffs mostly in terms of carbohydrates, proteins and fats—carbohydrates in sugars and starches; proteins in meat, fish and eggs; fats in salt pork, olive oil and butter. Nowadays dietitians talk more, perhaps, about vitamins and minerals. But in

Much like an old apple orchard is this plantation of cork trees in southern France. Cork is one of the major critical materials, largely imported from Portugal. It is now missing from many products that are non-military items. So important is this tree that Government agencies are seeking out the best cork oaks, both as a source of supply and as indication of where these trees grow best. Report any to your State Forester.

Plant peanuts—five million acres—southern farmers are urged, but the elephants will get few this year, for every peanut counts for the war-time value of its oil.

Peanut oil is the coming thing in food oils. The demand for increased production of the goober is the biggest "uppance" sought for any agricultural product.

terms of bulk the Big Three are still supreme in the foodstuff world. Lacking any one of them no man can live, and no nation can fight.

Of all of the Big Three, green plants are the prime sources. Plants take in carbon dioxide and water, and out come sugars and starches. By some alchemy as yet humanly undiscovered, they revamp and recombine carbohydrates and form fats; they juggle atomic groupings in another way, add nitrogen and a mineral or two, and build vastly more complicated molecules of proteins. Animal bodies can do similar recombinations, but the prime mover of all is the plant, with its carbohydrate machinery. The United States Department of Agriculture has elaborated a huge and carefully-planned program for getting that machinery into war-work. With manpower reduced by draft and defense industry, and with imminent critical shortages in gasoline and machines and machine-replacements, the American farmer must struggle with a crop-increase quota in nearly every item of previous production. Besides increased demands for old standard products of bread, butter and fiber sorts, he must face the prospect, furthermore, of raising many substitutes for old materials cut off by Oriental aggression and by ship shortage.

In most kinds of plant foods—wheat flour, potatoes, apples and even spinach—carbohydrates predominate. If a man can fill, or even half-fill, his stomach with digestible plant material, there is little danger of carbohydrate-starvation. Potatoes and the small grains—rice, wheat, barley, and rye—are the great bulk-carbohydrate foods, and throughout much of the world there is scarcity of all of these. Even before the War, German chemists, trying to reverse some of Nature's syntheses, produced a more-or-less digestible wood flour for mixture in bread.

Here, we are more fortunate. Even though the great pure-carbohydrate food, cane sugar, has now been rationed so long that no discussion of the matter would sweeten our tempers, we have vastly more of it than our tough colonial forefathers ever saw—all we need, dietitians say, for health. In the first world conflict we had not only Great Britain but much of Continental Europe to feed. "Wheat would win the war!" and we plowed up hundreds of thousands of acres of semi-arid land which should have been forever left in range. We won the war—or thought we did—but we also produced Dust Bowls and a huge unmanageable surplus of wheat that has plagued us ever since. It was no small factor in bringing on the great depression. Wheat is the one major crop we are still trying to decrease under the 1942 Food for Freedom Program, which calls for a general goal of 119 per cent of recent average annual production of America's farm products. We have so much wheat that literally there is not available room to store it. We argue whether to turn our surplus into synthetic rubber via alcohol and butadiene, or to release it at below-parity price to feed cattle and hogs. But probably we shall need whatever may be (Continued on page 498)

In Nature, the artists and the predators, and others by circumstance, are—

The Solitary Ones

By ARCHIBALD RUTLEDGE

Most of us know solitary human types; not many realize that in the world of Nature many beasts and birds "live alone and like it." As we explore the reasons for isolation of certain children of the wild we find that some are born solitary; some acquire that state; while still others are forced into it by circumstances.

Like their human counterparts, Nature's artists are often solitary in their habits. The wood thrush lives apart, in a kind of shadowy avoidance; the nightingale loves seclusion. From my own observation, the greater singer a mockingbird happens to be, the more likely is he to be an aloof individual. Not all members of a species famous for its song are equally gifted as singers. With the mockingbird, I have long since been able to tell, by their musical performances, whether Kate or Henry, Eliza or Jonathan happened to be serenading me.

A mockingbird, especially one that is a great artist, will take up his abode in the dense privacy of a cedar, a honeysuckle tangle, a moss-veiled oak. That retreat becomes his castle. Unless he is singing or scolding intruders, he is silent, probably meditating new love lyrics. He regards as a marauder any living thing that comes near his home. Vigilant and dauntless, he will dart out of his shadowy palace doors to drive away man, beast, or bird. He is just as testy about visitors in the winter as he is in the summer. Although a divine singer, when disturbed he is liable to become a common scold. Some human opera singers are like that, we understand. The mockingbird, having behaved hysterically to cats and dogs, crows and bluejays, men and women, horses and mules, will, as soon as he has recovered his equanimity, rebuild all Eden in song.

Isolated by the individuality of their artistic temperament, nearly all the great artists among the birds are solitary—the veery, the parula warbler, the catbird, the brown thrasher, the wood thrush are among these.

A blue heron stands, a silent and solitary sentinel, on the shore of his chosen lake. Herons are among the birds with a taste for a life of solitude.

Certain birds, by no means artists, like to live alone. The yellow-billed cuckoo is one. The yellow-breasted chat lives sequestered. The weird anhinga is a bird apart. A love of solitude is in their blood.

Predators, among birds and mammals, although sometimes hunting in packs or droves, are usually solitary. By so living they can best stalk their prey. Owls, hawks, and eagles; the waders such as the egrets and the herons; even the flycatchers are solitary. They are hunters, but they do not hunt in packs. Among our native wild animals, the wildcat, the fox, the mink, the raccoon, the opossum, all these prey on other creatures in Nature. All these live a life of solitary, wise and happy in his avian hermitage.

Most birds and mammals that live a predatory existence are by nature solitary. Usually they hunt alone even though they may migrate with their fellows. Hawks and owls are among these.

One of the most interesting hunters among the birds is the belted kingfisher. In a very real sense each kingfisher owns a game preserve. His domain will be a certain stretch of stream, lake, or river; and he does not trespass on other kingfishers' properties. He excavates a hole for his nest in his own bank. He is secrecy and shadowy stealth. I have found the bull alligator to be a regular brigand in his lonely life. Like the kingfisher, he will assume lordship over a certain lake, pond, or stretch of stream, and he will kill practically everything that comes within reach. Hogs, dogs, deer, wild ducks, fish, calves, wading water-

fowl—all these go to satisfy this mailed minotaur. Exceptions to the rule of solitary hunters may be found in the peccaries of south Texas, in gray wolves, and now and then in coyotes, although most of these operate alone.

One of the most interesting of the solitary birds is the loggerhead shrike. He is a carnivorous bird, feeding chiefly on grasshoppers, mice, little birds, moles, and small snakes. I have found him killing the cottonmouth moccasin and the copperhead. Having taken his prey, he impales it on a thorn, a sharp twig, or even on the barbs of a wire fence. Nature started to make him a predator but did not finish him. He has the beak of a bird of prey, but his legs are short, and he has no talons.

The solitary rogue is always the most sinister and dangerous predator. A rogue elephant is a formidable beast, traveling alone, sullen and crafty, forsaking the herd, prompt in attack, ready in defense, full of resources. A mordant individual, he has developed a definite personality. Wherever elephants are found in their native state, from time to time there appear these solitary rogues, who, apparently mistrusting the intelligence of the herd, prefer to live out their lives alone. Bears are eminently solitary and individual wolves may desert the pack. In France, in the eighteenth

The ferruginous rough-legged hawk, opposite, and the burrowing owl both lead a largely solitary existence. Their solitude is well expressed by these two fine photographic studies of the birds by J. W. Jackson.

century, there was a fearsome lone wolf known simply as *Le Bête*. He is known to have killed more than a hundred and sixty human beings. Crafty, wild, and huge, he was more than a match for dogs and men who pursued him. It was only after three years of hunting him that he was killed, and then only after he had killed two men on the final hunt.

Some of these great solitaries of Nature become as lonely as Lincoln, Caesar, or Eve. Not all of them are menacing in their attitude toward man. I have known a good many whitetail stags to become solitary; and when they do, they take on the exciting glamour of real personages. I do not consider that their detachment makes them intelligent; rather their intelligence makes them solitary. The philosophers have had their ideas about solitude. One of them remarked that he who is solitary must either be a god or a devil. This truth is substantiated in Nature. The artists in Nature might be considered the gods, and the killers, the devils. These latter are they who render Nature "red in tooth and claw."

Some wild creatures—and this is especially true of mammals—, while not solitary by nature, may become so by force of circumstance. For example, the whitetail deer is highly gregarious; but if one is wounded, he immediately separates from his fellows. Indeed, the surest sign of a deer's being wounded is the fact that he at once leaves the herd. This is probably less realization that he can no longer keep pace with his fellows than knowledge that his condition calls for an immediate and radical change in his habits. A wounded deer sequesters himself; eats little; drinks much; rests completely, and often recovers from wounds that no human being could sustain.

When I was a boy, I used to kill a good many shorebirds, among them the long-billed curlew, now almost extinct. While these beautiful and graceful birds were still plentiful on the southern coast, I stopped shooting them, and for a reason.

At daylight on the lonely marshes, I had shot and broken the wing of a curlew. He fell to earth, and stood on the wet sands, calling melodiously but lamentably. The flock from which he had been shot contained about twenty individuals. As soon as their fallen comrade began to call, although they were then a quarter of a mile away, they wheeled and came back to him, answering his pathetic flutings with deep human whistles of their own. My first feeling was that I had an excellent decoy in the wounded bird. But the sun rose over the stupendous sea-marsh, tingeing the distant pine woods, making radiant the immense reedland, and lighting up the lovely plumage of the would-be rescuers of their wounded comrade. Some might say that the emotion that prompted them to return was curiosity. Who can tell? I only know that in their voices there seemed to be a human concern; compassion. More than their sunrise beauty and their grace, their cries affected me. Nor did my presence keep them away from danger. They circled close over my head, apparently more intent on their mission of mercy than on their own safety.

I did not shoot again, nor did I ever kill another curlew. I took home the wounded bird. Knowing a little about tying a splint on a broken wing, and also about feeding a bird of exacting food habits, I soon had the invalid well again. Few experiences in life have ever given me greater satisfaction than that of taking this captive down to the wild sea-marsh, releasing him, and seeing him rejoin his fellows in the immense liberty of the sky.

Wild creatures do therefore sometimes lend a hand to their fellows in distress. At a time of migration, in the huge and misty night, I have known a wild goose to get lost from the flock, and have known the flock to circle in a wide arc to pick him up. But these examples of what might be termed sympathy are exceptional in Nature. Most creatures show an utter indifference to the misfortune of their fellows. Perhaps they do not understand what is the matter. Others take a grim advantage of misfortune.

Certain wild creatures become solitary during special seasons. As a rule the mothers of the wild undergo a transformation in character when the vital duties of motherhood approach. While there are some exceptions, usually the grand business of caring for the young devolves upon the females alone. They become wary, secretive and almost completely isolated from their kind. Deer, which commonly travel in small herds, separate as the spring comes on. Every doe becomes solitary until the birth of her fawn.

Of course, with wild things that live alone, and prefer to do so, even solitary ones have their mates. Eagles mate for life; but the male and the female hunt separately. It appears true that by far the greater part of the time and attention of Nature's children is given to the business of sustaining life itself. There comes a season when the immortality of the species has to be provided for. And if solitude is the safest way to carry out the destiny of the kind, it is chosen.

Sparrow-folk

By F. W. HUTT

Too wrapt in its sorrows to mind us,
The warring world rumbles along.
There are few who might follow and find us
Out here, for our whisper of song.
Who cares, in the throngs of the cities
What happens to sparrow-folk here?
Who thinks, with compassion—or pities
The tramps of the variant year?
Yet, wanderers over the Barrens,
And rovers through pasture and glen,
Lorn hosts of the deep bogland warrens,
Unknown to the dwellings of men—
Though faintly our tiny song calleth,
We, too, have our fears and our foes,
And surely, not one of us falleth,
But God, the Omnipotent, knows.

Fulgora was the goddess who presided over lightning and her name was given to a superfamily of insects, the Fulgoroidea. The Fulgorids are those in which the head is notably developed, as with *Fulgora lanternaria*, an extreme, weird but not rare insect of the American tropics. Photograph from Ward's Natural Science Establishment.

Camouflage

By CORA BURLINGAME

MEET a gallant neighbor of tropical South America—a finger-long insect with a wing-spread about the same as that of our cecropia moth. This fascinating, grotesque invertebrate commands respect from the most blasé observer because its disguise is related to its primal urge for survival. Its false face is a stark necessity. To unmask would be to die.

This insect could be a delectable tidbit for predatory birds and small mammals. It has no claw, no sting, no poison, no spine and no disagreeable odor with which to serve notice that it is not fit to eat. It has no tough hide to protect itself from the enemy. It can only bluff its way to security by pretending to be a dread reptile or some other fearsome wild beast.

How successful is its camouflage can be judged by the accompanying illustration. Its snout is streaked and rough. The simulated teeth in jaws that never open are in relief. They gleam like pale ivory in the diffused light of a tropical forest. An aggressor is further intimidated by the "eyes" placed at a safe distance from any vital part on each hind wing. These are structureless devices, painted in satiny, phosphorescent black and yellow circles that glare and quiver in the dark like the eyes of a predaceous, hungry animal. Little monkeys and big birds glance in the direction of this innocent, innocuous bug and promptly take to the taller timber, or to the safety of the air.

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NIGHT

By LALIA MITCHELL THORNTON

The damp winds whisper to the painted sumac,
But what they say no wandering night moth tells;
Above the hill there sounds the gentle tinkle,
Like elfin music, of the cattle bells.

Along the lake a lacy line of spindrift
Dapples the border made by reed and fern,
Would that this magic hour might last forever,
And day forget its promise to return.

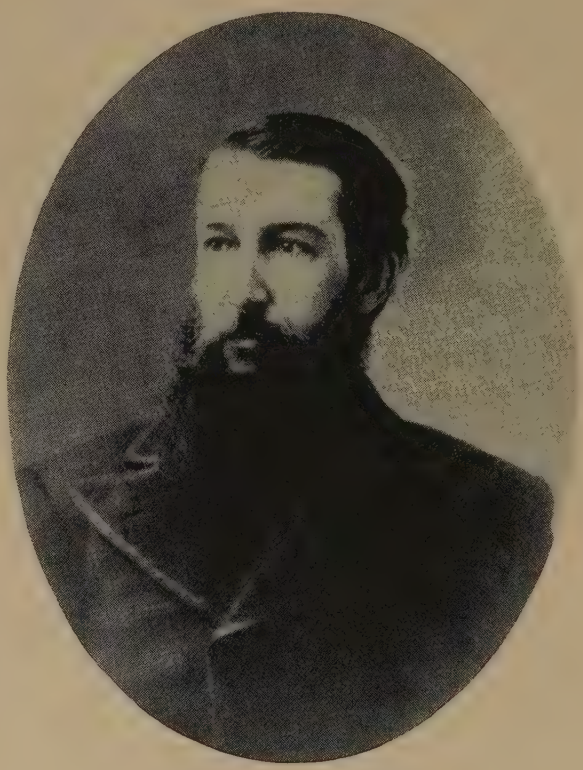
Centennial of his birth turns attention of music and Nature lovers to—

Sidney Lanier, Nature Poet

By PAUL H. OEHSER

LET US forget for a moment, if we can, the eclipsing clouds of a terrible world war and remember, gratefully, an American poet who was born a hundred years ago this year at Macon, Georgia. Sidney Lanier was his name, and it is particularly fitting that this magazine should observe his centenary, for he was one of America's outstanding Nature poets. There have been few really great ones, but certainly William Cullen Bryant, Ralph Waldo Emerson, Henry David Thoreau, Walt Whitman, and Sidney Lanier are among them.

Each of these poets conceived and wrote of Nature in his own individual way. To Bryant, for example, Nature was God's sublime and orderly handiwork, in which men may read the lesson of eternity and conform their lives accordingly. Emerson found in Nature the essence of all thought, philosophy, and beauty. To Thoreau, Nature was a matter of scientific observation and sensuous perception. Whitman identified himself with Nature; Nature was his steadfast credo, "Nature without check."



SIDNEY LANIER
(1842–1881)

But to Sidney Lanier Nature in its broadest appeal was primarily a symphony of ineffable and healing music, a great orchestra that sang of God's goodness. Lanier himself was a born musician and a composer of some eminence, and it was therefore quite natural that he should be quick to perceive those deeper harmonies and rhythms of Nature that escape the prosaic and insensitive among us. For is it not true that most of us human beings, somehow shielded by an unshreddable carapace, travel the green earth impervious to her subtlest and loveliest harmonies?

In Lanier's poetical work, which is contained in a single volume that has been continuously in print since 1884, two kinds of Nature poems are obvious. First, there are the verses dealing directly with individual aspects of Nature, as a bird or a tree, in an appreciative, apostrophic, or descriptive manner. Typical of these is the sonnet entitled "The Mocking Bird," which not only describes the bird but puts a question to science that has intrigued many a Nature lover:

Superb and sole, upon a pluméd spray
That o'er the general leafage boldly grew,
He summ'd the woods in song; or typic drew
The watch of hungry hawks, the lone dismay
Of languid doves when long their lovers stray,
And all birds' passion-plays that sprinkle dew
At morn in brake or bosky avenue.
Whate'er birds did or dreamed, this bird could say.
Then down he shot, bounced airily along
The sward, twitched in a grasshopper, made song
Midflight, perched, prinked, and to his art again.
Sweet Science, this large riddle read me plain:
How may the death of that dull insect be
The life of yon trim Shakspere on the tree?

Delightful as these verses are, their kind is not what has given Lanier his truly deserving fame as a Nature poet. Rather this fame has come because of the great Nature hymns—"Sunrise," "The Marshes of Glynn," "Corn," and parts of "The Symphony"—in which he combined his love of music and his love of Nature in a rhapsodic and inspired utterance. Here the poet's passion for beauty and his belief in the healing power of Nature are brought to their highest expression:

Oh, what is abroad in the marsh and the terminal sea?
Somehow my soul seems suddenly free
From the weighing of fate and the sad discussion of sin,
By the length and the breadth and the sweep of the marshes of Glynn.
Ye marshes, how candid and simple and nothing-withholding and free
Ye publish yourselves to the sky and offer yourselves to the sea!

(Continued on page 500)

"An Indian V"

By ELLSWORTH JAEGER

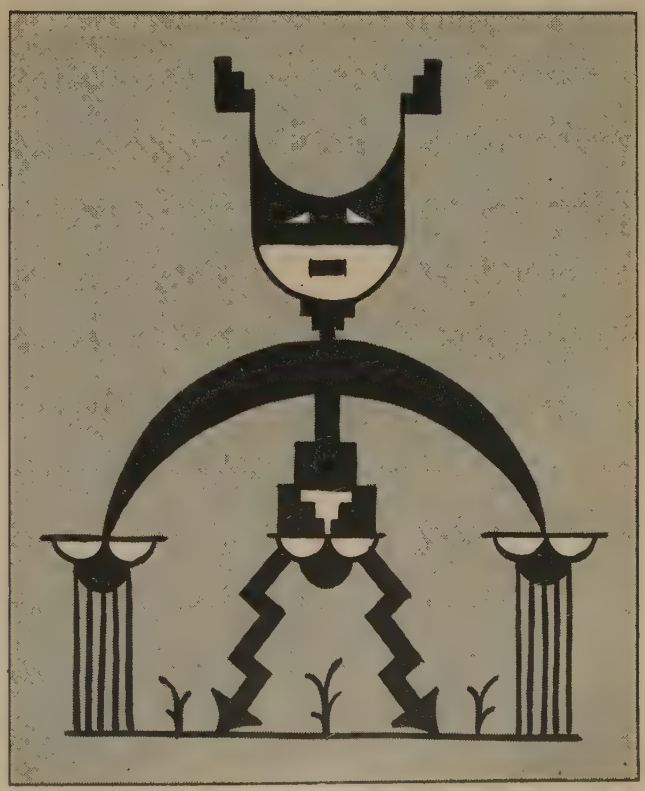
THE prehistoric past of the Indian is not as far removed from our modern war era of today as one would suppose. For instance, the salute we now give, and know as the "V for Victory" symbol was a common sign, especially among many of our prairie tribes. But in the sign language of the red man, the V shape, made with the index and the middle finger was not really symbolic of victory. In fact, it was the sign for "wolf" or "scout". The V-shaped finger sign represented the upraised ears of the alert wolf.

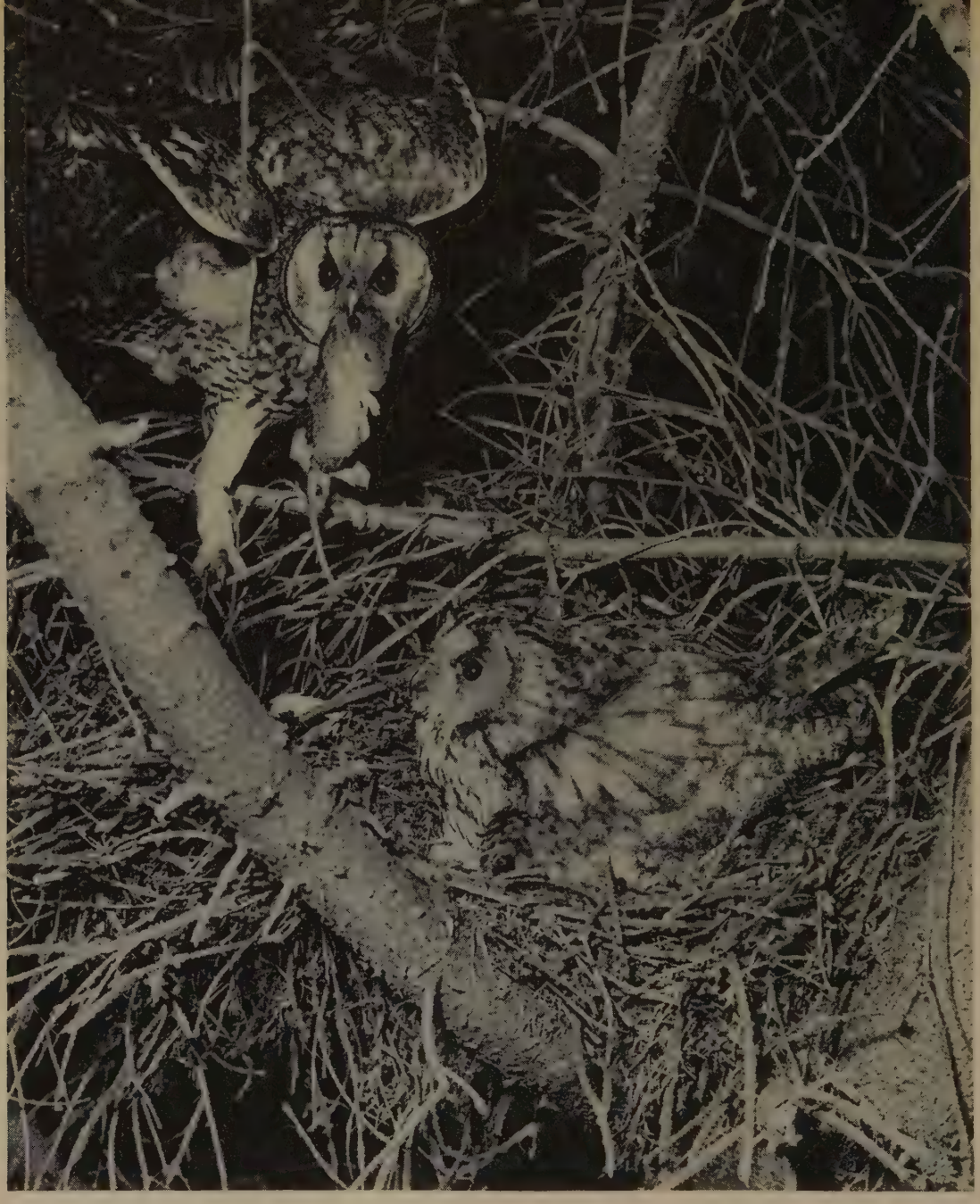
The origin of this sign is interesting, and is, indeed, closely related with the wolf. In those early days, Indian scouts often wore the skin of a large buffalo wolf over their heads and bodies. In this disguise, they were able to sit in plain view upon some butte and spy upon the enemy's position. It was astonishing how wolf-like these scouts appeared. Often they would signal to others of their war party with wolf howls, which, when given by a talented scout, made the masquerade appear all the more realistic. On rare occasions the wolf impersonator might be too generous with his calls, or too proud in showing off his howling ability. The enemy would then send out some expert stalkers of their own, and take the synthetic wolf.

Thunder God

SINCE the beginning of time, there seems to have been a mysterious innate wisdom within living things. In animals, we call this "instinct", and we take it to be some form of ancestral heritage given by a benign deity. But in man, this wisdom is all the more mystifying for often so-called superstitious fancies of prehistoric man, prompted no doubt by reasoning without definite knowledge, have been found to coincide with modern scientific knowledge. For instance, some of the ancient lore of the Southwestern Indians has a close relationship with the most up-to-the-minute discoveries in modern science. The desert Indians have always considered the lightning and thunder storm to be male forces of Nature, which fertilized the earth and made it fruitful. Both in the present day and in the prehistoric symbols of these people, they often show lightning in the act of fertilizing the earth, as below.

Today electrical engineers have discovered that the action of lightning bolts, flashing through the earth's atmosphere at a speed of some sixty million miles an hour, extracts nitrogen from the air. In the form of nitric acid in the raindrops, it falls to the earth and enriches the soil. It is estimated, that in this way, one hundred million tons of nitric acid are produced by lightning in one year, which adds up to more plant food than is made in all the world's fertilizer plants.





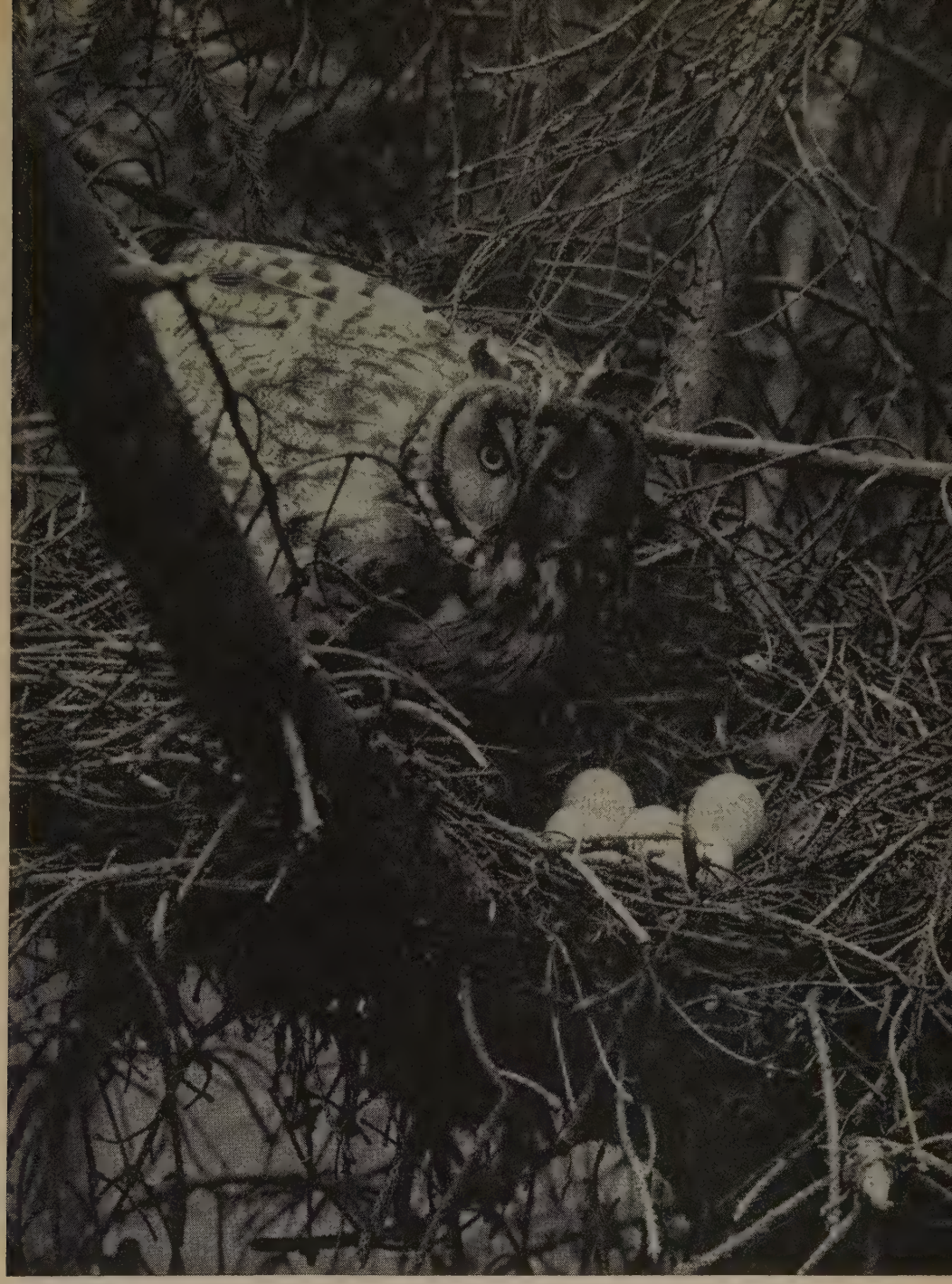
Father Long-ear brings home the bacon—or, in this case, a half-grown rat that dangles from his bill as he arrives at the nest. While in the company of his mate he seems greatly excited, possibly from pardonable pride. He rolls his body from side to side and flaps his wings as he passes the tid-bit down to the brooding female.

Spying on the Long-Eared Owl

Photographs by the Author

By ERIC J. HOSKING

PEEKING over the edge of her nest, the owl watched us start up the tree to the platform where the blind was placed. Silent as a thought she planed away at once when we reached the hideout, usually going out of sight, but once to the top of a fir about forty yards away. When I was left alone with my equipment she would come back, now and then directly to the nest but more often by a series of cautious halts. Each time she stopped she would glare at the blind and the camera lens sticking from it. As she glared she bowed low, then suddenly stretched up to full height and, intently gazing at the blind as though to penetrate the canvas that held its mysteries, the owl swayed from side to side. Since no answering sway came from the strange contraption in the tree she would feel safe and return to the nest. Once there,



When the female long-eared owl is excited her facial disc is brought forward and all of the feathers on her body are puffed out. The result is a terrifying appearance that is probably intended to intimidate any enemy. Normally the face is rather shrunken in appearance, with the ear tufts held upright.

she looked terrifying, her facial disc brought forward, her horns or ear tufts flat along the crown of her head.

She was a European long-eared owl, known to ornithologists as *Asio otus otus,* although until quite recently birdmen regarded this owl as of the same species as the American long-eared owl, *Asio wilsonianus.* The differences between the two in looks and in habits are so minor that the only reason for naming two species is, perhaps, that a wide ocean separates the two forms. Nevertheless, observations of one apply equally to the other.

Spying on the family intimacies of the long-eared owl must be pretty much a nocturnal occupation. Friend Long-ear is largely a bird of the night, in fact, it does its courting after dark in the usual manner of man. Night observation, of course, provides problems, some of which are difficult if not impossible to overcome, but this adds zest to the moonlit activities of the prying human.

Long-eared owls choose home sites wherever there are considerable stretches of woodland, particularly among firs or pines. Several families may be found in such an area. The birds do not build their own nests, taking over an old bird or squirrel nest. The family I spied upon dwelt in a crow's nest of considerable antiquity. No abandoned site being available, the owls may take a tree fork, less frequently a hollow, and, more rarely, may nest on the ground among heather and bracken.

In England the owls usually lay eggs during March, four or five to the clutch. In my experience the female alone incubates the eggs, but there are records of both

parents sharing this task.

To return to my particular long-eared owl family, it was found in early April with five eggs already in the nest. The home site was twenty-three feet above the ground and my blind was constructed on a level with it. Confronted with the responsibility of incubation, the female appeared to lose all interest in the noises and oddities of the human intruder. She would sit for hours, unexcited, her face normal and somewhat shrunken-looking with the ear tufts upright. Only twice in one eight-hour stretch of watching did she change her brooding position.

Owls in general lay eggs on alternate days, or with a lapse of three or four days between. So the young hatch at intervals and the first arrival may be a week or ten days old before its brothers and sisters have emerged. My owl family proved different since all five eggs hatched in a little more than two days, suggesting that incubation did not begin until the last egg was laid.

Like a lovely tawny kitten, the female owl sits on a branch near the nest, a pose assumed now and then as a rest from brooding the eggs.

Father Long-ear must have had good information on when the first chick was due, however, for that night he brought two short-tailed field voles and one rat, leaving them lying on the sides of the nest. This was the first food I had seen at the nest, and I am sure its arrival that particular night was no coincidence. During the daylight hours the male was nowhere to be seen. Suddenly, at dusk, there came a drawn-out "ooo-oo-o" from near the nest. The brooding female answered with a call like the sound made by drawing in air from a comb and tissue paper. This led to an exchange of calls, the female becoming excited, quivering and vibrating her wings. This "conversation" may have been the female ordering dinner, for soon her mate arrived with a young rat in his bill. This caused mutual excitement. The lady quivered her wings. The old man slowly flapped his wings and rolled his body from side to side, clutching and unclutching the branch on which he was perched. There was some more calling in subdued tones, then the male left the rat in front of his mate and departed.

It was then mealtime for the owlets. Without rising from her brooding position, the mother bird gripped the rat in her talons and pulled at it with her bill. She swallowed the fur that was first detached, but when she got to the meat she plucked and passed tiny morsels to the chicks. The food had to touch the owlet's beak before it would open its mouth. If the portion was too large for one chick it was offered to another, and if none could manage it the mother ate it herself. Each chick fed at each meal and seemed gorged at the end. The mother finished what was left and tried to clean the nest of fallen bits of food. This method of feeding was quite different from the hawks, who usually stand by the side of their young at mealtime.

While mother was home with the children, the male made an average of five or six trips to the nest between dusk and dawn. Food appeared to be brought each time. It was impossible to tell definitely but the calls and conversations were the same. These owls, the male in particular, would not stand for any artificial light. Even a faint blue lamp, shaded and suspended at some height above the nest, would keep him away.

So far as I could tell the male hunted within a restricted area, and there seemed to be good hunting. Throughout the night he could be heard calling at about ten minute intervals, the female usually answering him. Early one morning, before daylight, the male called very loudly while flying near the nest, a sort of "whack-ack-ack." His mate answered with an unusual note—a "whoof-whoof" that sounded as though air was blown through the nostrils. There was complete silence for more than an hour, so perhaps the old man had just asked permission to fly afield for a bit.

Rats, field mice and voles were the diet. There was no evidence of either birds or insects in the pellets, indicating the definitely positive value of this owl, member of a persecuted and misunderstood tribe of useful birds.

One other observation that long-eared owl spying provided was a glimpse at courtship display. While watching one night a short distance from a small spruce-fir wood, I saw a male just above the tree tops. He was circling in a limited area. Occasionally the wings were clapped together, making a sharp report. Then the bird would dive into the wood and remain out of sight for some minutes. So far as I was able to judge he perched beside the hen at these times because "conversations" could be heard before the display flight was resumed. I know not what was said.

IN THE AUSTRALIAN BUSH

By JOSEPH R. SLEVIN

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Australia may justly be called Nature's land of the grotesque. Its mammals, birds and reptiles justify this definition. Among them the duck-billed platypus, the egg-laying mammal, the delightful little koala—now so nearly wiped out—the beautiful lyre bird, and the kangaroo, are widely known.

Many still think of Australia as a great island continent, inhabited only along the edges, its center an unknown wilderness. Actually this inner country supports many great cattle and sheep ranches, or "stations", and large areas are set aside for the aborigines of the continent.

Modern agencies of transportation —the automobile and the airplane— have brought easy access to the Australian "bush". This has aroused Australians to the necessity of setting aside areas as wildlife sanctuaries and game refuges to preserve the strange and interesting fauna of the island.

However, if one is to see the varied wildlife of Australia today, time

Mother kangaroo and baby, or joey, as it is called. She stands to look around and the baby takes a peek also. Below is the camp of the author in the Jarrah forest of Australia, where Nature is now seldom disturbed by man.

and the ability to live in the wild outdoors are necessary. Also patience and interest are essential if one is to study wildlife in its natural habitat.

Hiding in some secluded spot, one may see the great gray kangaroo, perhaps a band of them as they graze warily, alert for some marauding dingos, the wild dogs of Australia. Active and powerful, these keen-eyed marsupials, if frightened, can easily outleap a running wild dog. I have perceived a sort of cooperation between the big white cockatoos and the kangaroos. From my hideout, watching the latter, I have heard a passing flock of the birds sound a warning to the animals that has sent them rapidly

away to some safer haven they know.

In picture and story the most peculiar birds and mammals have been most publicized, but the reptiles are equally bizarre. One of these is the frilled lizard. You may come upon one in a eucalyptus forest crouched by the entrance to an ant hill awaiting dinner. Probably the frilled cape will be folded back over the shoulders. But fear of the intruder sends this cape upward, and from its center gapes an open mouth equipped with sharp teeth. Although undoubtedly terrifying to its enemies, to the human the bold and courageous pose of the "frilly", eyes aflame and collar extended, is merely amusing.

If the frilled lizard is grotesque, the bearded dragon is the real clown of the Australian lizard world. Alarmed, it fills its lungs with air, swells to outlandish proportions, and extends its beard, which is fringed with rows of sharp spines. Actually it is a quite docile fellow, and, unalarmed, will allow itself to be picked up without attempting to bite or to escape.

There are many smaller lizards, and the native reptiles include several species of pythons, which, although they grow to a length of twenty feet or more, are not classed as dangerous. The giant brown snake is the largest venomous snake in Australia, growing to ten feet. The black snake, tiger snake and the death adder belong among the deadly species, and there are others considered mildly venomous. Australian snakes, however, are secretive and will seek to get away rather than to attack humans.

Study of the reptile life alone in Australia would be a life work for a capable herpetologist, for there is much to be learned of the habits and life history of these inhabitants of the bush country.

The emu is an Australian bird that has been introduced to many as a convenient three-letter word in crossword puzzles. It appears on the coat of arms of Australia and on one of the country's stamps. Unfortunately, the emu has been a victim of persecution on the ground that seeds of the prickly pear cactus stick to its feet as it wanders

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The "Bearded Lizard", *Amphibolurus barbatus*, is the clown of the lizards. On the defensive it makes both a ridiculous appearance and one that must be frightening to small enemies. Next, below, the "Frilled Lizard", *Chlamydosaurus kingii*, stands at bay with its sharp teeth and powerful jaws ready to grab whatever comes within its reach. At the bottom is an Australian skink, *Egernia nitida*, found abundantly in the great Jarrah forest of the southwest. It peeks out of a crack in an old log to survey the scene before emerging.

Emu mother and chicks. The youngsters are always striped or mottled, giving them an excellent protective color pattern. Mother guards them carefully and sends them scurrying for cover at the first sign of danger and they are then very difficult to find.

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for food through the cactus patches. Thus it has spread the bane of the stockmen. In Queensland much money was spent in an attempt to exterminate the bird. However, the cactus has now been quite well controlled, and the birds are no longer extensively disturbed.

Why the emu was not wiped out seems a mystery to one who sees them standing within a short distance of an automobile gazing curiously at the contraption. However, let the car door be opened and the bird will be off in a flash, and it can travel rapidly. Those who have attempted to clock its speed from a travelling car credit the emu with a speed of from thirty to forty miles an hour. On foot it takes all the skill of a bushman to get within rifle range of the bird.

Less successful in the face of persecution, mainly shooting it for fur, is the harmless and unique little koala. Feeding only on certain species of eucalyptus, it was easily shot by hunters for the few cents brought by the skin. Koalas are now strictly protected in tardy recognition of their charm. Their pictures are found on all Australian travel literature, and appear on one of the Australian stamps. Their exportation alive is prohibited both as a matter of protection and because the species of eucalyptus on which they feed are not found elsewhere. Such attempts as have been made to acclimate them in zoological parks in the United States and Great Britain have been uniformly unsuccessful.

Australia's parrots are notable members of the bird family "down under". The gorgeous king parrots are seen in numbers, their crimson breasts making a picture worth coming miles to see. At a bush watering place to which the parrots come one gets a rainbow-like scene.

The kea of Australia is one of the parrots that has been given a bad name as a sheep killer, but studies by competent ornithologists fail to bear out this indictment. Indications are that they offered a good target for hunters in regions where other wildlife was not abundant, and the ill-repute given them was an excuse for extensive shooting.

To return to an Australian reptile that has a unique habit that places it properly among the interesting inhabitants of the bush country, we mention again the death adder, one of the deadly snakes. It has a clever way of obtaining its food. It will hide under dead leaves on the forest floor, with its short, orange-colored tail tip protruding. This the snake waves to attract the attention of some unsuspecting and hungry bird. The bird thinks that it has come upon some toothsome insect and darts at it. Thereupon the adder strikes, killing its victim instantly.

Any attempt to describe or picture the wildlife of Australia in a brief space would be impossible. However, those interested in this subject may pursue it further by

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The little koala is now perhaps the widest known of Australia's mammals, vying in interest with the platypus. Here, a baby koala keeps watch while mother, rolled into a ball of fur in the fork of a favorite eucalyptus tree, takes a snooze.

The Australian death adder, *Acanthophis antarcticus*, is numbered among the deadly snakes of the island continent. It lurks under dead leaves, waves the orange-colored tip of its tail to attract birds, and strikes instantly when one comes near. The curious little wood gecko, below, *Diplodactylus vittatus*, is a nocturnal fellow, coming out only at dusk to prey on night-flying insects, of which there is an abundance in the Australian bush.

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reading one or more of several excellent books. Among these are: *The Call of the Koala* by Ambrose Pratt; *The Platypus, Its Life and Habits* by Robert Eadie; *The Platypus* by Harry Burrell; *An Aviary on the Plains* by Henry G. Lamond; *Bird Wonders of Australia* by A. H. Chisholm; *Australian Finches in Bush and Aviary* by Neville W. Cayley; *The Insects of Australia and New Zealand* by R. J. Tillyard. Consult your local library.

A baby walrus, too young to have tusks. After the death of its mother it was fed on canned milk and seemed to thrive. It was six or eight weeks old, and destined for the Chicago Zoo. Below, an Eskimo models a raincoat made from scraped and dried walrus intestine. It may seem a bit large for him but it provides freedom and lasts as long as our own oiled silk garment.

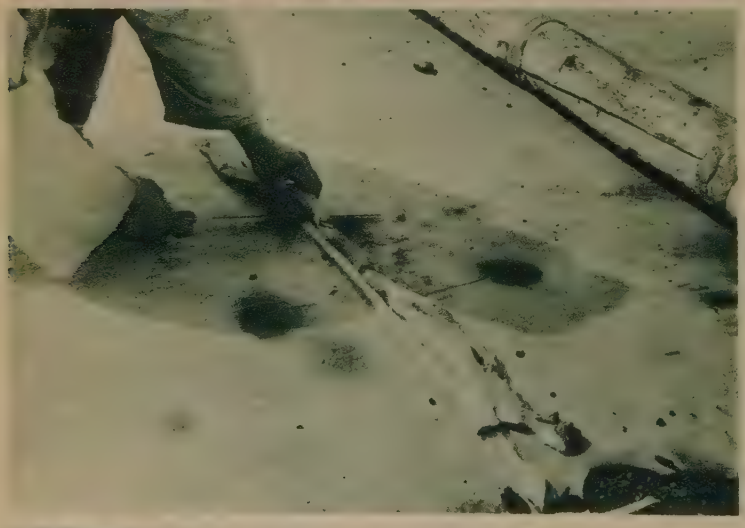
Walrus—Many-Purpose Animal of the Arctic

By DOROTHEA C. LEIGHTON

St. Lawrence Island, Alaska, in the northern part of Bering Sea, is one of the most westerly of Uncle Sam's possessions. It is inhabited by Eskimos, who live much as did their ancestors. They depend on the sea for food, living chiefly on the walrus that comes down in the fall with the ice and disappears towards the North in the spring. Since these animals, with their strong tusks, can rip an Eskimo boat to pieces and even kill its passengers, procuring the family food supply is not simple.

Besides food, the walrus serves the Eskimo in various ways. The blubber is used for the lamps, which serve for cooking and heating. The skin is cut into strips to make a tough rope, and for roofs, boat coverings, floors, and to protect household goods against the weather. The intestines are scraped, dried and made into raincoats that wear about as long as ours of oiled silk. The stomach is scraped in the same way and used as a bag for storage. The tusks are useful, also, being carved into harpoon heads with which to hunt other walruses. They also provide runners for dog sleds, lures for fishing, arrow heads, bodkins for weaving, handles for knives, toys for the Eskimo children and for carving into innumerable objects of artistic merit for sale to the white visitor.

The pictures on these pages were made during a summer in which the author and her husband devoted their time to anthropological studies of the St. Lawrence Island Eskimos. We found the many-purpose walrus, and the versatility of the Eskimo in making use of this animal, to be an interesting sidelight.



The walrus skin is stretched on a frame and is split by a skilled woman. This housewife trims off the bottom edge, leaving a skin twice as large and half as thick as when it covered the walrus. She uses the curved "woman's knife" with great skill. The skin is fatty but is fibrous and tough. The skin is then stretched and dried. When ready for use it is about the consistency of linoleum and is very strong.

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Since this interesting species is now represented by only a remnant of its former numbers, we quote the following from an extensive account that shows former conditions. It was written by Edward W. Nelson from his experiences in Alaska, 1877-1881, published in 1887 as Misc. Doc. No. 156, 49th Cong., 1st Session.

"The range of this unwieldy animal does not extend south of the Bering Sea shore of the Aleutian Islands. They are unknown there, except on Unimak, the easternmost of these islands, where they sometimes occur in winter. Along the adjacent shore of Bristol Bay, on the northern side of the Alaskan Peninsula, are several well-known hauling grounds which they visit for a short time each year, about the middle of June. Elliott states that some thirty or thirty-five years previous to 1873 they were sometimes killed on the islands of the Pacific, between Unimak and Kadiak.

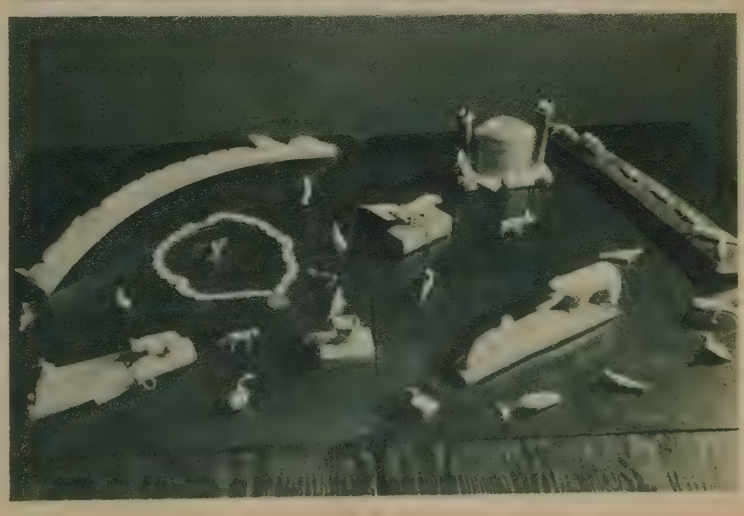
"From Bristol Bay north to the southern mouth of the Yukon they are rather numerous for a time in spring, just as the ice breaks up, and again in fall, in September and October, before the coast becomes ice-bound. Some winter off the coast between Nunevak Island and Bristol Bay. The coast between the Yukon mouth and Golovina Bay is rarely visited by them now, although they were formerly common there in fall and spring. In Bering Straits they are very numerous every fall and spring, moving south before the ice-pack in autumn, and following it as it retreats into the Arctic in the spring. During nearly all the year a few individuals, mostly males, are found about Walrus Island, off Saint Paul, of the Fur Seal group, where they were formerly abundant. They are also about Saint Matthew Island nearly or quite all of the year, and occur in great abundance about Saint Lawrence Island during the migrations. At the latter periods they are also numerous along the Siberian coast of Bering Sea and the straits. North of the straits they are widely spread in summer, but keep in the close vicinity of the ice-pack.

"During the summer of 1881 we found them along the Siberian coast west to Cape North, and thence north to Wrangel and Herald Islands, and along the pack easterly to the Alaskan coast, near Cape Lisburne, and thence north to Point Barrow, but they were not seen away from the vicinity of the ice. . . .

"According to the natives living along this strip of coast [Kuskikwim Bay], the young walruses are born early in spring, when the ice breaks up, during April and May. They report the walruses as being very timid and inoffensive animals at all other seasons, but say that the hunters give a female walrus with young a wide berth at this time. The female becomes very savage, and, like a bear with her cub, she has only to catch sight of an intruder upon her domain to make an attack. . . .

"When the Russians first occupied the Fur Seal Islands the walrus was very numerous there, but the seal hunters soon drove them from Saint Paul and

Walrus skin roofs for Eskimo houses have become rare on St. Lawrence Island. They let through a pleasant, yellowish light. Below, a walrus-skin boat puts out to sea, its passengers, perhaps, seeking other walruses for their food. Walrus tusks that furnish ivory for harpoon heads, sled runners, boat keels and carvings for sale to the white people. Some of the clever ivory carvings, including little animals, cribbage boards, paper weights, an ash tray and a necklace.



Saint George. On Walrus Island they were not troubled, and Mr. Elliott found a herd of about five hundred bulls in possession there up to 1874; since then they have greatly diminished in numbers there, and will eventually entirely disappear. Their skin is a mottled yellowish-brown, with very short, rough bristles scattered over it. It is wrinkled into folds all about the neck and shoulders. The animal's posteriors are disproportionately small as compared with the anterior half of the body. The males exceed the females in size and reach a ton or more in weight.

"The tusks of the female are long and slender and are usually curved inward so that the points nearly touch. The tusks of the males are shorter and stouter, with the ends several inches apart. The largest pair of tusks I ever saw weighed 16 pounds. . . .

"To many of the Eskimo, especially on the Arctic shores, this animal is of almost vital importance, and upon Saint Lawrence Island, just south of Bering Straits, over eight hundred Eskimo died in one winter [1879-80], owing to their missing the fall walrus hunt while on a prolonged carouse upon whisky obtained from a whaling ship.

"To these northern people this animal furnishes material for many uses. Its flesh is food for men and dogs; its oil is also used for food and for lighting and heating the houses. Its skin when tanned and oiled makes a durable cover for their large skin boats; its intestines make waterproof clothing, window-covers, and floats. Its tusks make lance or spear points or are carved into a great variety of useful and ornamental objects, and its bones are used to make heads for spears and other purposes.

"The middle of August, 1881, we spoke to a walrus-hunter on the edge of the pack, off Cape Lisburne, and found that he was leaving the hunting ground, complaining that the pack-ice was so thin that when a walrus was shot the blood from the wound thawed the ice, and caused the edge to break, resulting in the loss of the game before its tusks could be cut out.

"The continual pursuit these animals have suffered during the past few seasons has rapidly thinned them out and, owing to the restricted basin which they inhabit, it is only a matter of a few years when they will become comparatively rare where formerly abundant, and unknown in many of their former localities. Today it is safe to say that the number of these animals in existence is not over 50 per cent of the number living ten years ago, and a heavy annual decrease is still going on."

It is scarcely necessary to say that the continued destruction foretold by Mr. Nelson sixty years ago threatens the walrus with virtual extinction.

It is now illegal throughout Alaska to kill or to possess any walrus or any part or product, excepting under permit for scientific purposes, and excepting those killed by the natives for their own use, or by miners and explorers when actually in need of food.

BULLOCK ORIOLE

By W. GORRELL, JR.

On this page we have some intimate glimpses into the family life of the Bullock oriole, western relative of the Baltimore oriole. Above, the mother bird eyes the camera warily and then provides a tidbit for the youngster that has climbed up the lining of the nest to receive it. Below, the young birds are becoming venturesome, and, in the inset, one of the youngsters becomes definitely friendly and confident.

Bullock oriole takes much care with the construction of its nest, which is a pensile basket of coarse vegetable fibers, sometimes with twine and shreds of wool, and lined with finer fibers. It holds from three to six eggs. The same tree may be used again and again as a breeding site, and six or eight nests are often seen in the same cottonwood tree, showing all stages from the new home to the well-frazzled ones of previous seasons. This species chooses open country near the tree-grown margins of streams. It may be found in suitable locations throughout western North America, from the Rocky Mountain States to the Pacific, and north to the Canadian border. The song is not so varied as that of the eastern relative. This bird feeds on caterpillars and other insects, including the injurious scales that create havoc in olive and other orchards. It is fond of fruit, but when found in a berry patch is probably taking more green larvae than berries, and thus is of much service to the grower.

As We See It

★

Our Country, 'Tis of Thee

By GRACE V. SHARRITT

**Who we welcome with this,
a guest editorial**

PERHAPS now, as never before, our country—our land—has a new, significant meaning. The melody of a song sparrow or the whistle of the cardinal sounds far sweeter than ever in contrast to roars of alarms and perils. The way of a bee with a flower holds infinite interest and peace to minds besieged with fears and sorrows. Scents of orchards ripening in the sun, or woodland leaf molds, or fields freshly ploughed, are balms to soothe troubled hearts.

However, with our country at war and with the momentous unrest of today, we are apt to forget that these sane parts of everyday living still exist. The phoebes, as before, nest along the girders of the old wood bridge; the cricket's tune still can be heard from his cool cave beneath a stone in the pasture; the milkweed buds, flowers and seeds as it has done for seasons without number.

These wings of a morning are not myths of happier years, nor ephemeral will-o-the-wisps of the present. These common, everyday occurrences of Nature are reality. And like reality, they possess power to rationalize thought. When a man has eyes or ears for a duck on a pond, an evening star, or a scampering chipmunk, that man momentarily has found respite from doubts and fears. When a woman observes a wildflower, listens to a robin's song, or reflects upon a sunset, that woman has had a refilling of serene spirit.

Why? Because wildflower, robins and chipmunks, like us, are of the earth. It is in that earth where our roots lie buried deep in beds of ancient soil. They are primitive roots. They are love of country, love of land, of singing larks and summer rains, and frosted grasses beneath autumn moons. Our country, 'tis of thee we think, and it is of thee we sing and pray!

John Burroughs once wrote, "I am in love with this world. It has been home. I have not bruised myself against it, nor tried to use it ignobly. I have tilled its soil." Therein breathed Burroughs' philosophy. He did not live to see this present world of hideous chaos, but his days on earth were passed during other terrible cataclysms. The reason for his great faith in the world was his love of the soil, of the trees, the rivers, the bluebird's nest, the toad in the grass.

Tilling the soil binds one in primitive wedlock to the earth. The turning of a clod, the feel of loam, the scent of the rich earth binds one to the elemental.

What a blessing to have a piece of land! No spot, however small, fails to give that feeling of complete happiness within, a sense of security and isolation from unrest. A feeling of fierce possession. Even if the soil you till can be, by force of circumstances, only the turned earth in a small dooryard or a porch-box, still that feeling of exultation can be found within its gates or four wooden sides. There is the crumbling and mixing of the soil to the right consistency; the sowing of seeds; the care of weeding, cultivating and nursing; the harvest of flowers; the fruit of creation.

It is the love of land that drove our forefathers ever to the west of our country. It is the love of land that prompts a European or Chinese peasant farmer to till and cultivate his small acre or two with painstaking toil and care, making each clod thriftily produce its fullest measure.

But it is the greed of land that causes wars and its ghastly travesties upon the soil. How painful to see one's garden torn and ravaged by enemy bombs!

To those, however, who cherish the feel of soil within their hands, who have knelt upon the earth to weed and harvest; to those who love the land, there does come reassurance. For we know, with a faith born of the soil, that life and the world are things of great periods of time; that there will be sunsets and singing birds and running brooks ages long after we have crept satisfied to sleep.

Our country, 'tis of thee I speak!

Nature in Print

By HOWARD ZAHNISER

EMIL LUDWIG, who some years ago established a great popularity by writing history in terms of biography, has more recently been inspired to relate the story of mankind to the natural scenes in which its events have transpired. Having written a biography of the Nile River, he now records what he calls the saga of a sea—the Mediterranean. It is a tribute to Mr. Ludwig's ingenuity and vision to observe that the interest in his new book—and it is a compelling interest—is aroused more by its descriptions of the outdoor world and man's relations to these surroundings than by the momentous historic events it relates. This observation, in turn, emphasizes with some freshness the significance of a concern with the aspect of our world that we call Nature, and thus the book appeals to a particular interest of the readers of this magazine.

Even without this element of special significance, there would be little likelihood that this saga of the Mediterranean could be read even at the great American distance from its setting without a sense of participation. This sense is sharpened, with neat artistry, by seven sketches of a lighthouse keeper in the Hyeres Islands whom Mr. Ludwig introduces as a prospective reader sitting under an olive tree and to whose interest in the reading he returns at the end of each of the volume's five "books" and at its conclusion. Yet, not only in imagination but also in reality we share the interest of the Mediterranean lighthouse keeper in his sea and its surroundings, for his beginnings were ours too and from his part of the Earth came much of the way of living that we now call our way.

When Emil Ludwig tells again the eloquent story of the Greeks and describes the Roman order; when he pictures Jesus, the Nazarene Jew, with his arms opened to the world, establishing "a community without nationality," he is indeed writing a history of the Mediterranean, but he is also using words that are as familiar to us and as intimately ours as the tales our fathers have told us of our own grandfathers and the American pioneers who came before them. When Columbus and his Mediterranean sailors crossed the Atlantic Ocean, they discovered another world for us, but like them we can never forget the land that they left. "The sons of the old mother were off to the New World," writes Mr. Ludwig. He might have added that her sons are our grandfathers, and we too are her descendants.

Perhaps we are even more interested in our grandfathers than we are in our cousins of the past five centuries, or of today. Certainly the latter part of Mr. Ludwig's book seems much less interesting and important to at least one American reader. Undoubtedly our sense of a common interest grows dull as the lighthouse keeper becomes concerned with the eighteenth and nineteenth century Mediterranean. Even the author calls his fourth book "The Forsaken Ocean." Yet the later part of the book, despite its dealings with our own affairs, is similarly unarousing.

One reason seems to be that the wars of later times are so much like those which preceded them that they become not only wearisome but depressing when recounted in a single volume. Of greater significance to many readers is the fact that by the last third of *The Mediterranean* Mr. Ludwig, confronted with the urgency of historic events, has come farther and farther from the distinctive characteristic of his book—its description of the Mediterranean itself, the natural scene. For good reasons the more recent elements of this description have been included with those of the past in the earlier part of the book, and as interest in commercial wars may lag it might be well for a reader to look again in the book's early pages, at the accounts which explain in large measure the reasons why men fight again the battles their fathers have already waged. For we have an enduring and very real common interest in the Mediterranean's natural resources.

"This book," says Mr. Ludwig in his preface, "is a sort of tapestry in which the reader will see beasts and men, trees and moun- (Continued on page 496)

Mysterious Okefenokee

By IRA N. GABRIELSON

OKEFENOKEE, "land of the trembling earth," is quiet in the noon-day sun. Only the shimmering heat waves betray motion—unless a turkey buzzard or a bald eagle soars in the sky. Apparently there is no land; only water and "bonnets" and "cypress bays" reproduced in reverse in the bordering water; a fantastic, unreal world with apparently nothing solid and substantial to dispel the illusion.

The boatman propels the lightly-built boat with rhythmic thrusts of the long pole, at the rate of about a mile an hour. Every bend in the "boat run" winding through the maze of islands and cypress bays presents a vista so like the last that one must look for minor details to detect a difference. Occasionally a startled pair of wood ducks splash noisily into the air, or a "poor Joe" (as goes the local designation for the angular, awkward, great blue heron) flaps away with dangling legs, ready to drop back into the water behind the first bit of tall vegetation. Perhaps an American egret is routed from his eternal frog hunting, which is good hunting indeed in Okefenokee, or a silent skein of white ibises rises from behind a cypress bay and glides on noiseless wings to a new feeding ground.

Morning and evening the swamp comes to life. The trumpeting of the Florida cranes echoes and re-echoes in the woodlands. The cat calls and hoots of the barred owl become a part of the chorus, while their author stares with dusky eyes at the intruders in his domain. These owls and the red-shouldered hawks, the one by night and the other by day, police the Okefenokee in unwonted numbers. In spring the bellowing notes of the old bull alligators furnish a background of bass for the most amazing frog choruses. Shrill voices and deep voices, soprano, alto, tenor, and bass, join in the amphibian symphony hour. The song is endless and

Majestic Florida cranes stalk about the "prairies" and nests of the young are often easily found if one knows where to look. These young cranes were photographed on the Okefenokee National Wildlife Refuge by Hayden Carter.

the supply of singers apparently inexhaustible, although they must indeed furnish a large part of the daily fare for many of the predatory denizens of the swamp.

A "coon's" face looking upwards from the mirrored surface of Okefenokee's dark waters may startle at first, but one soon learns to locate the animal itself on an overhanging limb. A sleek otter may glide silently and smoothly along ahead of the boat, or a large "gator" splash noisily into the water when disturbed in its sunbathing.

In the early morning hours the liquid notes from the golden throat of the prothonotary warbler mingle with the louder, ringing song of the Carolina wren, the rattle of the kingfisher, the strident calls of the crested flycatcher, and the duotoned whistle of the tufted titmouse. The simple, sweet trill of the pine woods sparrow comes from every island and shoreline where the pine and palmetto grow, and as evening falls the guttural chucklings of the chuck-will's-widow go on far into the night.

Majestic Florida cranes stalk about the "prairies," often easily found if one knows where to look, but one must take Okefenokee as it presents itself. One may cross from Camp Cornelia to Floyd's Island without seeing more than a half dozen egrets and blue herons, only to find the swamp alive with these and other water birds on the return trip. With the endless floating islands and patches of rank vegetation to conceal them, many birds can be present without being detected. There may be great companies of various species—the little blue, Louisiana, great blue, and little green herons, American and snowy egrets, black-crowned night heron, white and wood ibises, and the anhinga or water turkey. One may see all of these in a single day's travel and, again, see few indeed on another trip. These irregular heron squadrons are a part of the swamp, without which it would be imperfect, but the Florida crane, red-shouldered hawk, barred owl, pileated woodpecker, crested flycatcher, Florida grackle, and alligator are most eloquent of its varied life—although an odd lot indeed to be featured against such a background. These are the creatures that attract most attention. Nowhere else can one see more barred owls or beautifully-patterned red-shouldered hawks. No other single swamp has such a large breeding population of Florida cranes, while the long-tailed grackles and the crow-size, flame-crested, pileated woodpeckers are everywhere.

Alligators, large, medium, and small, sun themselves wherever there is unshaded ground. Rumor had it that Okefenokee's alligators were once almost extinct. Be that as it may, there was evidently ample seed stock left, which under protection has started vigorously to work to repopulate the swamp. The job is on the way to accomplishment for there is now a large population of small 'gators, a moderate number of the eight-footers, besides a small number of real old-timers. Several that are regularly seen will approach, and perhaps exceed, twelve feet.

Exhibits of a great turtle population decorate every floating log on sunny days. These range from huge snappers to the beautiful painted turtles and the leathery soft-shelled species. Thick-bodied, dangerous-looking "cotton-mouth" moccasins are everywhere in the swamp, and the less common diamond-back rat-

tlers, giants of their venomous clan, are occasionally found on the islands.

Tracks of bears, raccoons, wildcats, and deer are everywhere even though the animals themselves are more successful than their bird neighbors in keeping out of sight.

The teeming life of Okefenokee makes it one of the outstanding wildlife areas of the land.

Yet a visitor can be severely disappointed in his first entrance to this great swamp. I was, myself. Signs of human invasion—tumbling shanties, stumps of former forest giants, rotting trestles, scattered cans and bottles, and all the familiar refuse that goes with logging and lumbering—were painfully evident. My first trip, however, was some years ago, not long after the Bureau of Biological Survey purchased nearly 300,000 acres of Okefenokee from the Hebard Lumber Company, in 1937. Now some 327,000 acres out of the swamp's expanse of nearly half a million acres are within the Okefenokee Wildlife Refuge, and on the refuge area the man-made scars are gradually being healed by the swamp's rank growth of vegetation. Any impressions of disappointment are soon erased, not only by well-grounded hopes for a gradual restoration of the wilderness but also by the deeper impressions of admiration and awe that come to one as he penetrates more deeply into the swampy recesses of the area. Many stands of virgin timber, too small or too remote to justify the cost of logging in former days, still remain untouched. The total amount is considerable and adds much to the value and beauty of the swamp. One's final impression is that it is good that this weird land is to be preserved and, so far as possible, restored.

For Okefenokee is actually marvelous. Once behind the first cypress bay one beholds a peaceful, placid landscape that, with the reflections from the surface of the dark water, is like a hall of mirrors. All about are long thin lines of woodland swamp; clumps of cypress, hoary with the drooping streamers of old man's beard; and acres upon acres of water lilies. It is a land apart with even a terminology of its own. Okefenokee's "prairies" are the open marshes usually so thickly grown with lily pads that poling a boat through them is a slow and laborious work. The lily pads are the "bonnets," while a "hammock" is an area covered by a dense growth of broad-leaved trees. The scattered groves of cypress—always gray-green against the darker green of other vegetation—are "cypress bays" or "bays"; while a "boat run" is an open trail through the "bonnets," either natural or grubbed out by hard work with a potato hook, the tool used to drag the thick roots to one side. These runs follow about the same route each season and are used by the boatmen in getting about in the swamp. A "lake" in the Okefenokee is any body of clear open water. It may vary in size from an old alligator hole, worked out in the lily pads, to Billy's Lake, several miles long and from one to three hundred yards wide; the largest body of open water in the entire swamp.

The accepted, and often the only possible method of travel, except by wading and wallowing, is in a light, flat-bottomed boat propelled by a push pole forked at the lower end in order to get a purchase on the tangled roots in the bottoms of the "prairies." Scattered through the swamp are numerous islands, large and small, some elevated enough to furnish footholds for forests of magnolia, gum, or pine, while others are merely slightly drier parts of this damp world.

As a refuge Okefenokee defies classification. It is a migratory waterfowl area, for the summer wood duck population is large and the number of wintering ringnecks, mallards, pintails, and black ducks sometimes equals that of many waterfowl refuges. Yet Okefenokee is so huge that one may travel for hours and never see a duck even though a normal population is present. It is a big game refuge, for black bears and deer are plentiful in its somber depths. It is, in fact, a general wildlife refuge because of the abundance of raccoons, opossums, otters, herons, egrets, swarms of wintering robins, and myrtle warblers—a remarkable variety of wild creatures.

Physically Okefenokee is a vast boggy saucer perched on a height of land in southeastern Georgia that separates the Atlantic waters from those that flow into the Gulf of Mexico. St. Mary's River rises in this shallow basin and flows by an exceedingly devious course into the Atlantic, forming, in its course to the sea, part of the boundary between Georgia and Florida. Out of the western side the Suwanee gathers its dark waters and carries them into the Gulf. The swamp itself is a shallow basin with a hard bottom but filled with the mucky debris of countless generations of plants. Its reputed "sink holes" are nonexistent, or at least exist only in stories. General Floyd's army, bent on punishing raiding Seminoles, wallowed across the swamp in its campaign of 1838. The representatives of the Hebard Lumber Company did the same thing seventy-five years later when they cruised the timber and laid plans for logging, which began about 1909 and continued until the Federal purchase in 1937, although the major operations were over some years prior to that time. Neither found any sink holes.

The town that stood on "Billy's Island" and once boasted six hundred inhabitants and a motion-picture

Director of the Fish and Wildlife Service, which administers the famous swamp area in southeastern Georgia now known as the Okefenokee National Wildlife Refuge, Dr. Gabrielson writes of this unique sanctuary with authority and with the eloquence which comes from his own personal observations and his native gift of expression. This article, in an expanded and somewhat different form, will provide a chapter in Dr. Gabrielson's forthcoming volume, *Wildlife Refuges*, scheduled for early publication by the Macmillan Company.

show is now only a memory. The island and adjoining Billy's Lake have been given back to the wheeling eagles and ospreys and the gangling fishermen of the heron clans. Vanished, too, are most of the railroad trestles that threaded the swamp, and the screeching locomotives that hauled the cypress logs to the mills.

A more lasting scar on Okefenokee's primitive landscape is the great canal that was cut some twelve miles into its heart from the east. The objective of this ditch was to drain the swamp into the St. Mary's River. Fortunately this enterprise failed but it left a canal useful as a highway into the swamp for visitors and patrolmen alike. It did no permanent harm, and the muddy piles of earth left on either side have long been overgrown for the most part, with lush vegetation.

This canal, together with the "lakes," be they big waters or small alligator holes, furnish the fishing for which the area is locally famous. Huge large-mouth bass ("green trout" in Okefenokee parlance) and pickerel (called "jacks") are the principal game species. Smaller pan-fish are also present, a fact thoroughly appreciated by local residents and visitors alike, who in 1940 took 33,367 fishes from these waters under the free daily fishing permit system.

The fact that only a small proportion of the waters is open enough for fishing would seem to be a perpetual guarantee that Okefenokee will never be "fished out." That could be counted upon except for the swamp's trick of going nearly or completely dry during drought seasons. There is no great depth of water and the swamp is largely, if not wholly, dependent on the rainfall that reaches its own surface for maintenance of its water level. The great mass of decaying vegetation acts as a huge sponge, taking up the water and yielding it to the slow pull of gravity through the river outlets and somewhat faster to the more insistent urge of the hot summer sun. During severe dry seasons the fishes and amphibians alike are seriously reduced, and one or more successful breeding seasons at normal water levels are necessary to replenish their numbers.

It is emphatically the desire of the Fish and Wildlife Service to retain Okefenokee's primitive character and so far as possible to allow its restoration to the conditions that existed prior to 1909. Many years must pass before the greater cypress bays are again filled with swamp monarchs such as formerly existed. The pines and gums with their associated trees will come back faster, but it will take long years to refill completely the suitable parts of the swamp with their growths. Not that the cypress is gone—far from it. There are many small virgin groves that were never touched and numerous stands of trees that were too small to cut profitably at the time of logging, which in the intervening years have grown into fine bays.

Every plant and animal that was once in the swamp is still there with the possible exceptions of the panther and the ivory-billed woodpecker. Panther tracks are occasionally reported in or near the swamp, and it is possible that a few of these animals still exist in its more remote sections. Ivory-billed woodpeckers formerly existed here, and hope will not die that some individuals may still remain.

Patrol is a dominant feature of the management of the Okefenokee, made doubly necessary by the fact that the swamp has long been a hunting ground for many of those living near its borders. The majority of the people have been most cooperative, but the usual small proportion of violators remains. These insist upon trapping and killing in the refuge, but one by one they are apprehended and taken to court.

No roads will be built within the swamp, but travel will be confined to the canal and runs, by push boats in some areas and by small boats with outboard motors in others. Headquarters for control of travel into the swamp have been selected, but only one has as yet been established—at Camp Cornelia near Folkston. Eventually there will be a second on the western side of the swamp near the foot of Billy's Lake, and a third at the north end on Cow House Island.

It is felt that the swamp vegetation will completely restore itself if fire can be kept out. This, of course, is a prime objective of the refuge's administrators. Once restored, the vegetation may hide all scars and assure all comers an outdoors experience unequalled and unmarred by even the slightest twinge of disappointment. Mysterious Okefenokee has already become a mecca for wildlife enthusiasts from far and near, visitors who come and see and go away enriched, and the future will be better than is the present.

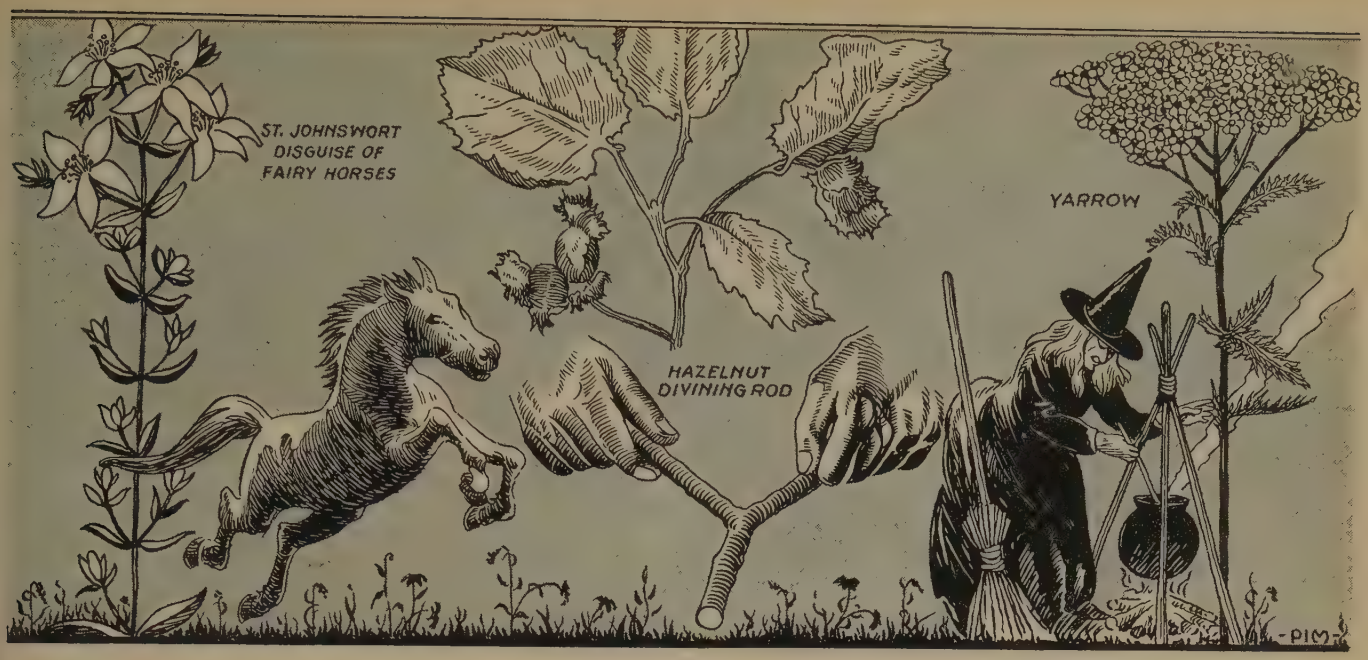
★

Rain Lilies

(which spring up on the prairie after rain.)

By HAZEL HARPER HARRIS

They stand upon
The freshened plain—
Small boyish figures—
After rain,
Their forms reflected
In a pool,
Like marble statues,
Smooth and cool,
Their slim, white fingers
Holding up
An alabaster
Drinking cup.



Yarrow and garlic, apples and mandrake, hobgoblins and witches are part of—

The Lore of Hallowe'en

By PAUL PIM

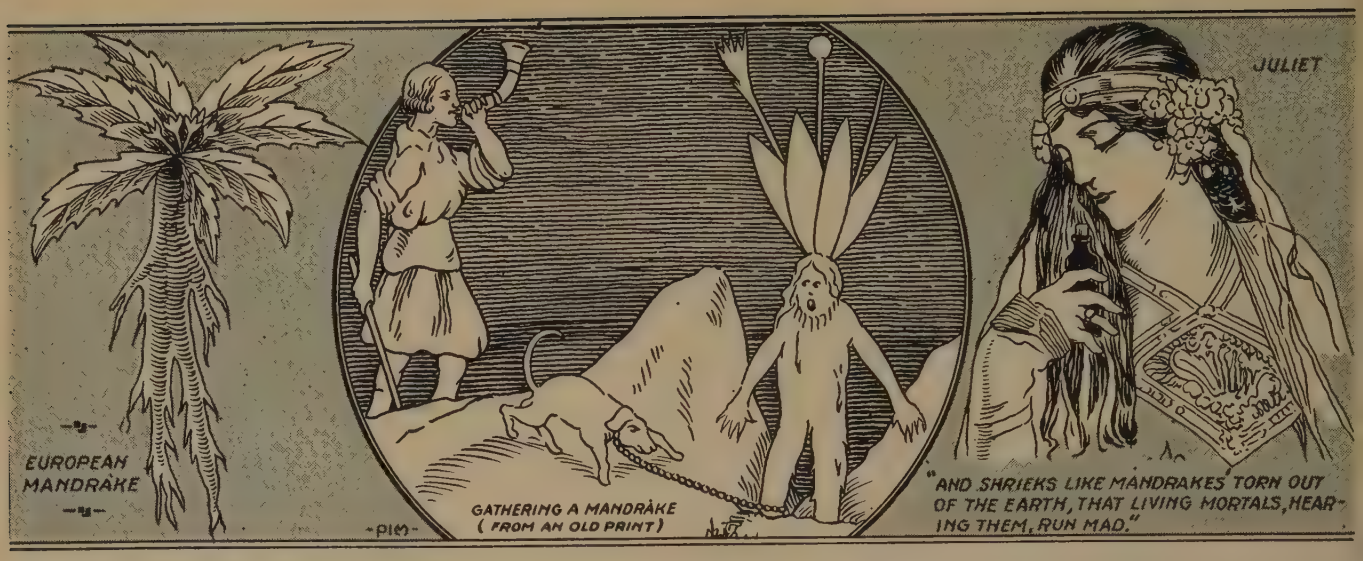
STRANGE THINGS happen on Hallowe'en. Witches ride aloft on broomsticks, fairies hold revel and the future is revealed by a variety of magic rites. All of which is quite different from the idea of Pope Gregory IV, who, in 837, named November first as All Hallows' or All Saints Day. Yet strange superstitions grew up around All Hallows' E'en that had no bearing on the religious observance of the following day. In fact, the celebration of this autumn festival seems to be a combination of two pagan observances, long antedating Christianity and embroidered through the centuries with a fine company of witches, ghosts, leprechauns, hobgoblins, elves and others of eerie ilk.

One parent of Hallowe'en seems to have been of Druidical origin. The pagan priests of the Celts of Gaul reserved one autumn night for feasting and merry-making when the harvests were in. Huge bonfires were lit to reveal the wicked spirits called together that night by Saman, lord of death. Thence come the witches and their kind. The other parent of Hallowe'en appears to be the Roman festival of Pomona, when apples and nuts of the harvest, representing the winter store of foods, were roasted before great bonfires.

In any case, Hallowe'en caught on, giving the superstitious and the credulous a chance to overwork their imaginations and conjure up all sorts of spooks and necromancy. Irish and Scottish folklore yields the most fantastic of the ancient observances of Hallowe'en. In Erin all the fairy hills are supposed to be open that eve to reveal the fairy treasures. Witches, warlocks and others hold high revel. The terrible Phooka is abroad, a great dusky creature now a horse or a pony, then a bull, and often a huge bird with fire gleaming from its eyes and nostrils. On Hallowe'en it lurks in lonesome places, creeps noiselessly behind the unwary traveler, and thrusts its monstrous head between its victim's legs. The amazed wayfarer, astride the Phooka, is whirled up to the moon, plunged to the bottom of a lake, flown over the ocean or to the tops of mountains, or travels remote realms of space between dark and dawn.

On Hallowe'en be careful not to tread on a St. Johnswort or ragwort plant for they are the day disguises of the fairy horses. Tread a plant down after sunset and a horse will arise from the root of the injured plant and gallop about with you all night. You will be unseated far away at dawn and find your absence hard to explain when you get home.

Many of the Hallowe'en observances were love spells. At night the colleens and the boys would go


EUROPEAN MANDRAKE
GATHERING A MANDRAKE (FROM AN OLD PRINT)
JULIET
"AND SHRIEKS LIKE MANDRAKES TORN OUT OF THE EARTH, THAT LIVING MORTALS, HEARING THEM, RUN MAD."

out into the garden blindfolded, and each would pull up a cabbage. The forms of the heads and stalks were supposed to indicate the physical peculiarities of the future husband or wife. If earth adhered to the roots he or she would have a dower. Were the roots sweet or sour, so was the temper of the spouse to be.

Hallowe'en bonfires are still lit in some places. Formerly the bonfire itself was lit by fire obtained by the friction of hazel sticks, called "fire from heaven" because of belief in the divine origin of fire generated by wood. In pagan times the bonfire was supposed to protect Welshmen from the attacks of demons. In the outlying districts of Wales the custom of lighting bonfires still lingers. When the flames die down some person shouts, "may the tailless black sow seize the hindmost". Then everyone runs away for, "the black sow of All Hallows is the very devil".

There is a long pre-Christian history behind the Hallowe'en customs of "ducking" for apples and burning hazel nuts. In old Celtic folk-tales and folk-poems the departed eat golden apples and golden hazel nuts in the Otherworld. Avalon, the name of that "land of youth", signifies "apple land". There a piece bitten from an apple is immediately replaced, the fruit being inexhaustible.

Apples served in love-divination ceremonies. Still a part of Hallowe'en amusement, these orginally were regarded seriously. Apples with secret marks, each representing a young woman anxious about her future, were dropped in a tub. The young men were called in, taking turns trying to catch an apple by mouth alone. If he was successful, the apple indicated the girl of his destiny.

Another superstition holds that if a young lady will eat an apple while standing in front of a mirror combing her hair, her future husband will look over her shoulder into the glass. She must under no circumstances turn around, or he will vanish. Another custom is to pare an apple and fling the unbroken skin over one's left shoulder. The initial formed or suggested by it is supposed to be that of the Christian name or surname of the future husband. Another girl will name a number of apple seeds for several eligibles, and the seed that stays longest when moistened and placed on her forehead indicates the man who will marry her.

The hazel, like the apple tree, was sacred. The shells of hazel nuts were burned and a divination was taken from the ashes. Another custom was to put nuts on the bars of the grate, giving each the name of a sweetheart. If a nut jumped or cracked that lover would prove unfaithful; if it began blazing, he was a true love; and if two nuts, named after a girl and a boy, burned together it was a sure sign they would be married.

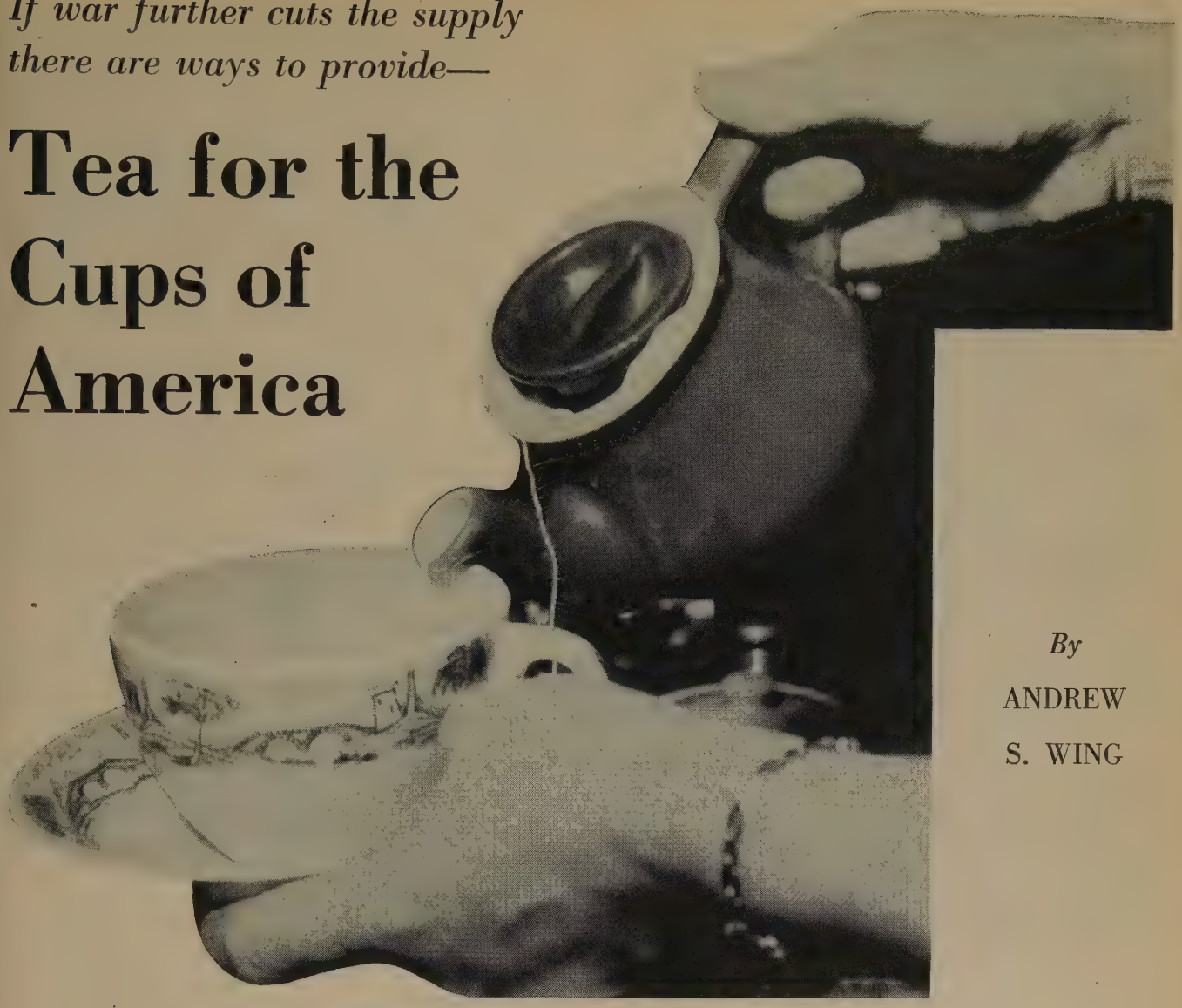
Young girls in England long gathered yarrow on Hallowe'en, sleeping with it under their pillows. It was supposed to cause dreams of their future husbands. Yarrow was considered indispensable in witch's brews, so in the days when the witch craze was at its height in England, many an innocent woman, gathering yarrow in the fields for medicine, was pounced upon as a witch. However, in Yorkshire, one has only to wear a lacy yarrow leaf to be fully protected from witches, devils and demons, which, in that part of England, strangely dislike this tangful herb. In the Hebrides it is thought that if you pluck yarrow leaves wet with dew and hold them against your closed eyelids, you can see anyone who is in your thoughts.

The most widely used of the potent charms in exorcising evil spirits was the peony root, which must be worn about the neck. Of course, a peony root must never be dug when a woodpecker is near, for this herb is sacred to him and he will fly down and peck out your eyes. The peony root was also considered to bring good luck.

In medieval days angelica root was thought to be a powerful charm against witches. They would naturally abhor it because of its name. Vervain root, when hung about the neck, was also a protection against both witches and devil, effective only when tied with white satin ribbon. (Continued on page 497)

If war further cuts the supply there are ways to provide—

Tea for the Cups of America



By
ANDREW
S. WING

ABOUT one hundred million pounds of tea are normally consumed in the United States in a year. About half that is the maximum available now and until Hirohito and his gang have been dealt with. However, while we may not be able to run our automobiles without rubber, if we let the Nips put on a global tea party at our expense we deserve the consequences. There are acceptable substitutes, you know.

With a bow to Britain as far in the lead, the United States is the second heaviest importer of tea. It comes from India and Ceylon, still open to us; from China, whose supply is largely cut off from export; from Japan, Formosa, Java and Sumatra, whence comes no tea for us today. When the little yellow men swooped from the sky on Pearl Harbor, we had a good supply on hand. Importers had suspected for some time that something besides tea was being brewed in Tokio. So we had about nine months' reserve, and that is being parcelled out on fifty per cent of normal basis. Even so, with shipping losses and diversion to more important cargoes, little tea is now coming in and experts in the trade regard the future for the tea drinker as none too bright.

About nine-tenths of our tea import is black or "fermented" tea; the rest is green tea. Japan is largely a producer of the latter, if that is any comfort. Both kinds come from the same plant, the difference being in the processing. Also the different kinds—Pekoe, Orange Pekoe and Oolong—are not from different varieties of tea plant but derive their classification from variations in the picking, grading and processing. Oolong comes from Formosa. Orange Pekoe is the reigning favorite with American tea tipplers.

Once before, if memory serves, we worried along on substitutes after heaving several cargoes of tea overboard into the waters of Boston Harbor. It is recorded that a lot of native herbs, shrubs and weeds, including "New Jersey Tea" were brewed to comfort the ragged Colonials and their folks back home during the dark days of the Revolution. So do not be surprised if your hostess hands you a strange-smelling drink with the explanation that it is Victory Tea or something like that. For that matter almost anyone with

a generous-sized garden could probably produce a half-dozen *ersatz* brands of tea with little trouble and the exercise of a bit of imagination. And they would not taste bad either.

The truth is that there are many plants that make refreshing and tasty hot or cold drinks. Some of these are the homely wild and cultivated plants we have known since childhood—peppermint, catnip, thyme, sassafras, spicebush and bee balm. Others are a bit more exotic, but have been known for hundreds of years to the old monks and herbalists of Europe or to the Indians of our own country. It is the native plants that seem to offer the greatest field for commercial exploitation as tea substitutes.

Used in moderation, tea is a pleasant and harmless stimulant to the average person. In China tea drinking is a gracious social custom; in Japan it is a religious rite; while to an English family an afternoon without tea is . . . well, horrible!

Just when or where mankind first came under the magic spell of tea, no one knows. Some believe that it was Confucius who taught the Chinese to drink it because the water supply was so foul that he wanted them to boil it. The great Chinese emperor, Shen-Nung, is also credited with the discovery of its exhilarating effect in 2737 B.C. Myth attributes tea to a Buddhist monk from India who, resolving to stay awake nine years in religious contemplation, found himself dozing at the end of a mere three years. Disgusted at his weakness, he cut off his eyelids and threw them on the ground. A bush immediately sprang up. It was tea, of course, the leaves of which are curled like eyelids.

Regardless of its misty origin, we know that tea was in general use in China in the seventh century. Within another hundred years it was borrowed, like so many other good things, by the Japanese. They refined the social custom of tea drinking into an esthetic and religious rite. But it was nearly a thousand years after that before tea was introduced to European society. In 1664 Queen Elizabeth was delighted to receive a small box of tea from an East India Company ship captain. Two years later Samuel Pepys noted in his now famous diary that he had tried the new drink for the first time. The custom evidently spread quite rapidly, like the habit of smoking tobacco, with the result that even humble American colonists had become addicted to tea drinking by the middle of the next century.

Picking tea in India. From the younger, smaller leaves comes the finest tea. Curing is partly mechanical but picking is done by hand by women, who receive only a few cents per day for their labor. The bushes are kept clipped fairly close to the ground for ease in picking.

The plant from which tea is made is an evergreen shrub, *Thea sinensis*, which, if not pruned back, will grow into a small tree. It is hardy in this country as far north as South Carolina. A 100-acre tea plantation was established there in 1880. It grew there, but tea can be produced economically only where coolie labor is available for the hand work involved in its picking and processing. In China, the growing and curing of tea has remained largely a cottage industry, the bulk of it being consumed in the country. But in India, Ceylon, Java and Sumatra, tea production has been developed by English and Dutch interests into a highly-organized plantation operation.

If it were not for the so-called "lift", that derives from caffeine in tea there would be plenty of other plants that could double for tea and coffee. Even though the war continues into 1944, or longer, and we have to worry along on half our usual ration of

tea, there are other substitutes that do contain the stimulating caffeine, and which are readily obtainable in this hemisphere.

Of course, if all one wants is a tasty or fragrant drink, there are the herb teas our forefathers brewed and drank both here and abroad. Some of these are quite palatable, and even beneficial as aids to the digestion or as nerve soothers. They are served at garden clubs and even in high-style beauty parlors. Others of these old-time favorites must be viewed with suspicion, in light of modern knowledge.

To find an acceptable substitute for tea, therefore, tea drinkers must look for something with a taste resembling tea, relatively harmless, and yet having the caffeine "kick". There are two American plants,

A branch of cassina with ripe red berries. The leaves of this holly offer the best North American pinch-hitter for our tea. While an attempt to popularize this as a drink some years ago met with quite minor success, it is possible that cassina may now come into commercial use.

available in commercial quantities, that offer such possibilities. One is a native of our own South; the other one is cultivated in Brazil. Curiously enough, both are members of the holly family, and both contain sufficient caffeine to satisfy the average tea drinker. Both plants have been in use for years by Indians and white people, and one of them is already on the market.

Our best bet from South America is maté or Paraguay tea, described at length in the October, 1942, issue of this magazine. The leaves contain around 1.25 percent caffeine, have a slightly bitter, tea-like taste, and when the beverage is taken in excess it is said to be intoxicating—as, indeed, is the case with both tea and coffee. But although maté has been on the market in the United States for a number of years, it has not yet met a widespread acceptance as compared with other popular caffeine beverages. It also has the present disadvantage of a long haul by sea along the submarine infested Atlantic Coast. So the other holly that grows here at home appears to be a better bet in case of a prolonged war.

Cassina, yaupon, or the so-called "black drink" of the southeastern Indians comes from the leaves of a small, attractive evergreen tree or shrub with bright red berries. It grows wild over an area of about 40,000 square miles extending along the coast from the James River south to Florida and then west to the Rio Grande. It likes a sandy soil and the leaves may be harvested from about May 1 to October 15. It can be grown to producing size from seed in five years. The caffeine content varies from .25 to one percent and the taste is quite pleasant after you have learned to like it. It is said that it is quite like maté in taste and can be blended with maté to make a brew that is acceptable to Americans who are accustomed to the real maté. The Indians used it in religious rites and seemed to derive stimulation from it. It goes by the not too attractive scientific name of *Ilex vomitoria.*

Cassina was fairly widely used in the South during the blockade caused by the Civil War. In 1922 an attempt was made to popularize cassina in this country. Some 15,000 pounds were harvested and thirty gallons of hot cassina tea were served at the County Fair at Charleston, S. C. About 1500 bottles of carbonated cassina "pop" were served at the same time, with popular acceptance. It is believed by George F. Mitchell, a leading tea expert, that it has other possible outlets, such as using it as a flavoring extract in ice cream.

Another holly, *Ilex cassine,* has a similar range as the true cassina, but it is low in caffeine content and in other ways is not as promising. Our common holly, or the deciduous swamp holly, or winterberry of the North hold little possibility. California's yerba buena belongs to the mint family, grows wild from California to British Columbia, and has long been used by both Indians and whites as a tea substitute.

Thus we seem to have a number of pinch hitters for tea. Whether any of them will ever catch the popular fancy sufficiently to make them more than temporary rivals or substitutes for the real thing is a question only events will reveal. At any rate we do not need to feel that Tokio has said the last word on this question. We are not so addicted to tea as to coffee, though our per capita consumption is rising. So maybe we can worry along until the war is won by the careful use of our available supply, supplemented perhaps by some of the home-made brews. If the war should continue for long we might have to change the old popular song to "Let's have a *different* cup of tea."

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Time given is Standard Time; add one hour for War Time.

War-time Astronomy

By ISABEL M. LEWIS

How, one may ask, can a subject that has to do chiefly with the nature, motions, and distribution in space of the heavenly bodies have any direct bearing upon the winning of the war? Do not astronomers concern themselves mostly with such problems as classifying stars; carrying on researches on irregularities in the motion of the moon or planets; improving star-catalogs or planetary tables; hunting for minor planets or comets on photographic plates, or computing their orbits; or, it may be, puzzling over the peculiarities of novas, or variable stars? Such problems do not seem of such vital importance today when we have a war to win, and that is the attitude, generally, of astronomers at this time. Astronomy as usual is out for the duration, and astronomy to win the war has taken its place; such as, for example, practical, navigational astronomy that tells the navigator of a ship or plane where he is at sea or in the air, and makes it possible for him to return in safety to his port or base, after he has found his target.

Every astronomer has been trained in the fundamentals of his science, which include a knowledge of the principles upon which navigation is based. Today hundreds of thousands of men must learn to become navigators as quickly as possible. Here is something that the astronomer can do that is of vital importance. Many astronomers today are giving guidance, advice and practical help to men in the service. These are, in turn, instructing groups of future navigators. In some instances astronomers themselves are engaged in teaching navigation directly. Younger members of the profession are in active service, in

places where their knowledge will be of most aid in winning the war.

Every astronomer has specialized training in mathematics; in practical computations, statistics, the plotting of curves and charts. There is need for such training in many branches of the service. Mathematicians are needed in ballistics, in statistical work connected with the war and in many types of war work. Many astronomers have had specialized training in photography and are giving valuable service in this highly important field.

The study of solar phenomena and the occurrence of sunspots is now a matter of practical importance. The sunspot cycle is closely tied up with magnetic disturbances, radio fade-outs, auroral displays and other meteorological phenomena that affect communications. It is necessary to carry on continual observations of sunspots and report the appearance of any unusual solar phenomena of whatever kind because of their effect upon radio and telegraphic communications. Even eclipses of sun and moon may be matters of importance as, for example, the total eclipse of the sun that will occur in the Aleutian Islands and Alaska next February. This might have a direct effect at the time upon bombing operations. Anything that dims or affects the light of sun or moon, or produces any meteorological effects of any kind, are predicted in advance whenever possible.

It is now of great importance to have readily available accurate information for our armed forces—in the form of charts or tables—of the time of sunrise and sunset, moonrise and moonset, and duration of twilight in all latitudes and at all times of year, as well as the times of the different phases of the moon. Never have the needs of navigation been so great and so varied as they are today. Trained navigators are as essential as ships and planes, and are required in greater numbers. Nautical and Air Almanacs in the most convenient form possible are now of vital importance to all of these navigators, as well as the accurate determination of time so essential to navigation. They are supplied by our Nautical Almanac Office and the Naval Observatory at Washington. It is primarily the job of the astronomer to see that the needs of the navigator—whether he is in the air or on the sea—are met in the best and most efficient way.

An astronomer with specialized knowledge of optical instruments is invaluable at this time, when there is an immediate demand for all kinds of such instruments and improvements in their design and use. The astronomer can now contribute to the service of his country valuable knowledge acquired in the astronomical laboratory and instrument shop.

The amateur astronomer, as well as the professional, can put his knowledge of the constellations to practical use at this time. Many who never knew one constellation or group of stars from another, with the possible exception of the Big Dipper, now want to learn, as soon as possible, the names and locations of the stars, constellations and bright stars most commonly made use of in navigation. Professional astronomers are comparatively few in number, but there are many amateurs. Learn the constellations and be prepared to give this information to others. It has been suggested that plane spotters may give the location of planes by naming the constellation against which they are projected, whenever it is feasible to do so. Amateur astronomers who have had practice in the observation of meteors should make excellent spotters of planes. Speaking of meteors reminds us that November is one of the months in which one of the annual swarms is due to appear, and thus a particularly good time to test ability to detect small objects that appear suddenly from unexpected quarters, whether of celestial or terrestrial origin. In meteor observations one must note rapidly and accurately the number, exact time of appearance, location, speed, direction of motion, color and brightness, compared to nearby stars of known magnitude, of these small particles of cosmic dust that flare suddenly to incandescence when they penetrate our atmosphere.

The Leonids are one of the best known of the annual showers of meteors. They appear in greatest numbers on November 16 after midnight and come from the general direction of The Sickle in Leo. They are swiftly moving and greenish in color. Although they may be observable on one or two nights preceding and following the date of maximum appearance they should be seen in greatest numbers on that date and nearer to the hour of sunrise than midnight. One should expect to see, on the average, about twenty an hour when they are appearing in greatest numbers. It depends largely upon the phase of the moon how many one will see. As the moon is at first quarter on November 15 it will be below the horizon soon after midnight on November 16, so if the skies are clear The Leonids should be observed under particularly favorable conditions this year.

Another swarm of meteors that used to appear in great numbers are the Bielids, or Andromedids, which were connected with Biela's comet, but these do not now appear in great numbers. They may be seen occasionally, however, between November 17 and 27, coming from the direction of Andromeda and therefore visible in the early evening hours. As they overtake the earth instead of meeting it "head on" they are sluggish in motion and reddish in color in marked contrast to the brilliant, greenish, rapidly-darting Leonids.

Orion is now coming into view in the evening above the eastern horizon to be followed some time later by the attendant dog-stars Sirius and Procyon. The Pleiades and Hyades in Taurus are now high in the eastern sky. The Great Square in Pegasus is near the meridian; the Big Dipper lies close to the northern horizon in our latitudes. Vega draws nearer the northwestern horizon while Arided, or Deneb, at the top of the Northern Cross, is still (Continued on page 497)

The School Page

By E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

IN THESE days when we are fighting for preservation of freedom, it might be well for school folk to consider the freedoms they have and the freedoms they might desire. There are few places on the earth where school programs are freer from indoctrination than in America. There are few places where young minds receive greater protection from prejudiced adults, at least so far as politics, religion and race prejudice are concerned. There are fewer places yet where a youth without backing from his parents can expect to carve out a more brilliant and successful life for himself. Even the handicapped person may expect a generous sympathy for his difficulties, and the wrong-doer may find a greater charity than he deserves. We seem to find freedom of a sort wherever we may look, and it is for the protection of these freedoms that we must now make sacrifices.

It is highly possible that the demagogue may use the term "freedom" to cover an attack on freedom, just as many educators have used the term "scientific" to cover a most unscientific procedure. So, while we have talked about freedom as an essential of the wholesome life, we in school have repeatedly allowed the freedom we have had to become circumscribed either because we are lazy or because those in authority over us have been able to dictate to us what we shall teach and how we shall teach it. It is becoming increasingly obvious that we cannot inherit freedom. Rather, we must earn and deserve it or we will lose it. And this is just as true in the school set-up as it is in other fields.

It should be obvious that in the field of Nature Education the best teaching can be done with the things at hand locally; with the things with which the pupil has been and will be associated both informally and vocationally. If we are striving to be the best educators possible, then it behooves us to know how to make first-hand studies of our immediate environment. Recently I interviewed a fifth grade youngster over the radio. She did not know what a nasturtium was although there was a beautiful bed of them in bloom in her own school yard. She knew all about igloos, or thought she did.

At a national meeting of a group of elementary teachers, the teachers had waded through slush, rain, sleet and snow for guidance in how they should teach their children. When one of them appropriately asked the leader what they should teach about weather, the answer was concerned only with the behavior of hot air over the tropics and of cold air in the polar regions. If the leaders of our teachers remain infected with this disease of favoring the remote over the immediate, how can we expect our teachers to avoid contracting the same disease? And if our teachers continue to avoid facing the issues and using the things at hand, they deserve to be told what they shall teach, when they shall teach it, and how they shall teach it. But unless they prepare themselves to do a superior job, they are bound to find restrictions imposed on them.

Dr. E. R. Downing has done much valuable work in the field of science education. He was a member of the committee responsible for the Thirty-first Yearbook of the Society for the Study of Education, which tried —futilely, fortunately—to tell us what we should do and how we should do it. He wrote an admirable analysis of the scientific method and emphasized the merit of critical thinking. But in spite of this, we now find him the author of a book entitled "Living Things and Us". One wonders what the distinction is. Is he right in assuming that we are not alive? When we reflect how inert many of us have been; when we have accepted as authoritative whatever we have found in the text or in the course of study, we are inclined to believe that he may have been right.

More appropriate may be reference to a college text by another author entitled "Man and the Vertebrates". If, as is implied by the titles of these books, we are dead invertebrates, then we have no right to claim freedom to decide what is best in the education of this or that child whom we should know best and for whose guidance we are responsible. A fourth grade boy who was asked if he knew the name of the creek over which he passed each day on the way to school told his parents not to be ridiculous, that they were spending too much time in school learning about Africa to be troubled with the names of local streams. It is quite possible that the teacher did not know the name of the stream, or could have helped the boy know about the life in it. You can be certain, however, that she did know just what the State Department of Education had said she should know about Africa. How can one understand a stream in Africa without knowing a local stream? Unless a teacher is a dead invertebrate, how long can she stand for such thorough supervision that everything she does and teaches is regimented for her? Of course, she cannot ask for freedom to do as her better judgment should tell her to do unless she can prove that she has something better to give. She must earn her freedom just as all freedom worth having must be earned.

In the present situation, we, in a republic, need to have our teachers demand and get a new freedom, the freedom to know our way about our own bailiwick. In case of a bombing raid, it will be more important if our children know other things than how to bound Bengal. Can you and your children make your way in any weather, at any time of the day, night or year, independent of any highway to the highest point on your horizon in any direction? If not, you have something to do that will be worth while, something that will be dramatic and interesting—and something that may prove very practical. You will not find this sort of thing recommended in any existing text or course of study, and, if you do it, you will have to win freedom that certainly is not enjoyed by all teachers at the present time.

Of course freedom—too much of it—may be a dangerous thing. Not long ago I visited a progressive group where there was so much freedom that those in authority let the children do everything as they wished. One group of youngsters had been working for more than two weeks on a table. I saw them sawing the last board. The board was a water-soaked oak plank. Two girls were trying to saw it with a buck saw designed to cut in one direction only. The board was not held firmly and wobbled freely while the saw protested the crooked course it was forced to follow. Those in authority refused to make suggestions as to how the saw might be used more intelligently, how its cutting edge might be saved, and how the children might cut the board more perfectly and with less effort. They said that they wanted the children to learn it for themselves. I felt that by the time they were sawing the last board for a table on which they had been working for two weeks some suggestion might be warranted but inquiry revealed that such a program was not

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"in the cards". Here was a case where there was too much freedom for a profitable experience. In the orthodox school, there is too little freedom for a most wholesome experience. Is it not possible and is it not necessary that we plot our course this year midway between these extremes?

There is not the slightest doubt but that the war will modify greatly what will be taught in our schools from now on. Much of the general science we have been teaching in the field of meteorology, physics and chemistry has been shown to be impractical to meet the immediate needs of those whose personal safety is not an academic problem. As a result, the "cram" classes through which our military folk are being forced bear little resemblance to the classes dealing with similar fields. A national committee is working on plans to make our school offerings more functional for those who may engage in active military duty and for those who may be in essential trades. This national committee cannot know completely either the technical or educational difficulties that the applications of their recommendations may meet. There is some probability that in many cases they will serve up the "old stuff" merely in a new "jacket". In either of these cases, there will be a need for teachers to display a new intelligence and to demand a new freedom if they are to serve their country to the best of their ability. I like to think that as a people we are rational enough to give those who can prove they deserve it every freedom that will best lead to the development of an intelligent citizenry able and anxious to solve its own problems, to stand on its own feet and to assume, not accept, leadership. Any other program must lead to a weaker democracy or a stronger dictatorship, neither of which is desired by most of us.

Alaskan Wildlife

In these days our attention to and interest in the outlying possessions of the United States is, perhaps, keener than in times of peace. Therefore publication of "Mammals and Birds of Alaska" by the United States Fish and Wildlife Service is particularly timely. This is a bulletin known as Circular No. 3 and is written by Frank Dufresne, executive officer of the Alaska Game Commission and the representative of the Fish and Wildlife Service, resident in Alaska. Copies are for sale by the Superintendent of Documents, Washington, D. C., for ten cents.

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This pamphlet is neither elementary nor advanced; it is new and incomplete.

NATURE IN PRINT

(Continued from page 482)

tains, migrations of peoples and of fish, priests and warriors, prophets and poets, and sailors constantly at work among them. Sitting before it he can choose what he pleases."

A more likely choice than any of those thus suggested by Mr. Ludwig for a featured interest in the details of this tapestry might seem to many Americans to be that relating to the plants of the Mediterranean, particularly its characteristic crops—"grain, the vine, and the olive tree." These Mediterranean crops are our crops too, and to a great extent they are a debt we owe to the Mediterranean. There are others also. "Date Growing in the United States" and "Fig Growing in the South Atlantic and Gulf States" are popular publications of our own Department of Agriculture. A few years ago the annual value of our date crop was $390,000, and the figs we raised in this country were worth $1,706,000. Wheat, the Mediterranean "grain" of which Ludwig writes, is so important to us that we also could hardly think of living without it. Wheat culture began among our American pioneers more than 300 years ago and moved westward with the settlement of our land, until now we raise an annual wheat crop on which we place a money value of more than half a billion dollars. The annual value of our grape crop a few years ago was more than $37,000,000, and our olive crop was valued at $1,260,000. These values are increasing as our plant scientists develop new strains and varieties and perfect better methods by which Americans can make the most of this Mediterranean heritage of the New World. We too can sit under our own vines and fig trees, and hold olive branches from American trees.

The grape of the Old World, *Vitis vinifera*—vine that is wine-bearing—has not only become the grape of our Pacific Coast vineyards but also, suggestive of other Mediterranean influences, has played a vital part in the improvement of native grapes in other parts of the country. Our olive trees have come to us solely from the Old World, and these are the immigrants that must have seemed most welcome among American plants to Emil Ludwig as he finished in California the book on the Mediterranean which he began on the Hyeres Islands before the war.

A century and a half earlier Franciscan Fathers had brought olives with them and planted them at the San Diego Mission. Some of these original trees are still thrifty and productive, and from this beginning olive growing in California has increased until the trees now cover about 26,000 acres on more than 4700 farms and are also grown in Arizona. Mr. Ludwig would doubtless be pleased to know that this Mediterranean fruit has been considered important enough in this country to be described and illustrated in a bulletin of the Federal Government's Bureau of Plant Industry, called *Olive Growing in the Southwestern United States.*

Certainly it is the olive tree that is most prominent in the whole tapestry that Mr. Ludwig has woven in *The Mediterranean,* and the use he makes of this tree—a symbol that he calls "as useful as it is beautiful"—is even by itself a means of richness for the readers of his book. In a volume of human history which unavoidably is concerned to a discouraging degree with the struggles of men who have not yet entered into a "community without nationality," it is indeed reassuring to read that "everywhere the olive tree shades the pages of ancient history, and everywhere its leaf is a sign of peace and happiness."

The Mediterranean: Saga of A Sea. By Emil Ludwig. New York: Whittlesey House, McGraw-Hill Book Co., Inc. 1942. 635 pp., with 36 line drawings by Rafaello Busoni, 4 text maps and end-paper map by Stephen J. Voorhies, appendix defining names and places, and index. $3.75.

Springer Spaniel

The Springer Spaniel. By Maxwell Riddle. Chicago. 1942. Judy Publishing Company. 160 pages. Illustrated. $2.50.

This is a second and revised edition of a book that has been as popular and as useful as the dog it describes. It covers the history, development, breeding, showing, training, care and feeding of the springer spaniel.

Youth and Science

Youth Looks at Science and War. New York and Washington. 1942. Penguin Books and Science Service. 134 pages. 25 cents.

This little book is a collection of forty essays written by nine girls and thirty-one boys who were the winners of the First Annual Science Talent Search for the Westinghouse Science Scholarships. This search was conducted by Science Clubs of America with the objective of discovering the most active minds among our future scientists.

Catholic Biology

Biology: Season by Season. By Sister Mary Anthony Payne, O.S.B. New York. 1942. American Book Company. 675 pages. Illustrated.

This is a most interesting book and a fine biology text written for use in the Catholic secondary schools. Indeed, we are surprised to learn that it is probably only the second textbook on biology written from the Catholic viewpoint to be published in the United States. It reflects the growth of appreciation of the importance of biology as a basic science for students, the majority of whom may not carry on into college work. Sister Mary Anthony has written a splendidly readable text; supplemented this with carefully worked-out suggestions for activities and self-testing exercises; made an excellent selection of illustrations, and supplied a valuable glossary and good index. She has set a high standard for other Catholic biologies to come.

Idaho Wildlife

Wildlife of Idaho. By William M. Rush. Boise, Idaho. 1942. Idaho State Fish and Game Commission. 299 pages. Illustrated. $1.00.

Through a collaboration that might well be copied in other States, the Idaho State Fish and Game Commission has had this book prepared and printed, and, through the Idaho Department of Education, presented 10,000 copies to the schools of the State. Written for the use of students in the sixth, seventh and eighth grades, the book seeks to acquaint the future citizens with the wild mammals, birds and fishes of Idaho and their importance. The author has chosen an interesting method of presentation, interspersing descriptive natural history facts with fiction stories that dramatize the animals and their relation to man. Unfortunately the book is not indexed, possibly on the theory that the table of contents is adequately inclusive.

Ragweed

As a companion to its recently published booklet on poison ivy, the Massachusetts Horticultural Society, Horticultural Hall, Boston, Massachusetts, has brought out another helpful booklet. This is entitled "Ragweed and Its Eradication," a title descriptive of its contents. Copies are available from the publishers at ten cents each.

THE LORE OF HALLOWE'EN

(Continued from page 488)

Shepherds in the Scottish Highlands often carry a piece of groundsel root to guard themselves and their flocks against the Evil Eye. Betony root was one of the magic charms against all sorcerers, demons, devils and witches. It was so powerful that one need only grow a single plant in the garden to keep them away.

The wild radish, when dug up with the proper incantation, will reveal the witches in the neighborhood. If they are dangerously near, a marsh mallow root will scare them away. Garlic, a sacred herb in ancient Egypt, has long been considered an effective charm against the machinations of witches, devils and magicians. So on Hallowe'en, when witches are abroad in the land, nothing can so well protect a man as a bit of garlic worn in a little bag suspended from the neck.

But of all the good luck charms nothing could excel the mandrake. Its root was thought by many to resemble a human form. The lower end of the root was often forked into two stout branches. These were the legs, while from the upper part two of the rootlets were sometimes large enough for a lively imagination to see them as arms.

There is probably no plant more surrounded by legendary lore and tradition than the mandrake. It was known to the Babylonians more than 3000 years ago. The Greeks had for it strange traditions, and in Eastern Europe, Arabia, Palestine and Syria, it has been associated with mysterious rites and customs.

Theophrastus (300 B.C.), the earliest writer on botany, alludes to the mandrake and credits it with inducing sleep and of value in love philters. The early Greeks called it Circeium, a name derived from the witch Circe, believing an evil spirit dwelt in the root. Pliny says of the mandrake that "he who would undertake the office of uprooting it should stand with his back to the wind, and before he begins to dig make three circles around the plant with the point of a sword, and then turning to the west proceed to dig it up." In other countries the gathering of the root was believed to be attended with great danger to the individual who had the courage to pull it from the ground.

The Greeks believed that when dragged from the earth the root gave a horrible shriek and struck dead the person who had the presumption to pull it from the ground. In order to avoid danger a dog was allowed to fast, then a cord was fastened to the plant and the tail of the dog. Food lured the hungry animal and it uprooted the plant, while the poor dog was supposed to be killed by the evil spirit. As the plant came from the ground, a horn was sounded to drown the killing shriek of the demon that dwelt in the plant. Shakespeare mentions this in *Romeo and Juliet* —"And shrieks like mandrakes torn out of the earth, that living mortals, hearing them, run mad".

The white hare is more feared on Hallowe'en than any ghost. It is thought that when a girl dies of a broken heart, having loved not wisely but too well, her spirit comes back in the shape of a white hare to haunt her deceiver. This phantom follows him everywhere he goes and cannot be seen by anyone but him. At last it causes his death—on some dark Hallowe'en.

WAR-TIME ASTRONOMY

(Continued from page 493)

well above the western horizon. Aldebaran and Capella shine brilliantly in the eastern sky.

The planets Jupiter and Saturn are now both in the evening sky. Jupiter rises about nine o'clock the middle of November, and lies nearly due south of Pollux, in Gemini, which it far surpasses in brightness. On November 12 it will commence to retrograde or move westward. Its position will change little during the month, however, not more than half a degree, at the most.

Saturn is now in fine position for observation. It will be in opposition to the sun on December 1 when it will be above the horizon from sunset to sunrise. On November 15 it lies about three and one-half degrees nearly due north of Aldebaran in Taurus. It is now exceptionally brilliant as it nears opposition. Next to Jupiter, it is the brightest object above the horizon, although only slightly brighter than Sirius, which now rises near midnight. Saturn is now a magnificent object in the telescope, as the rings are in a most favorable position for observation.

Mercury may possibly be glimpsed in the east on a few mornings early in November just before sunrise. It will be in conjunction with Mars on November 10, but the two planets will then be very low in the east at sunrise.

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PLANTS IN A WORLD AT WAR

(Continued from page 462)

left to feed a hungry world after the War.

Among other carbohydrate crops, rice and potatoes are slated to increase 6 per cent and 10 per cent respectively, while sweet potatoes go up only one per cent. The United States potato crop is to cover over 3,000,000 acres—slightly less than the area of Connecticut.

Proteins and fats present their own multiplicity of problems. Save for seeds and the jacketings of some fruits such as olive and avocado, plants accumulate little protein and little fat. So we feed on animals—cattle and pigs and sheep and salmon—which have eaten great quantities of vegetation, or of animal matter we do not care for, and have synthesized the proceeds to our better taste. It costs money to get them to do it, or to catch them after they have done it, and meat and fats and oils are accordingly expensive. For years, Germany has been short of fats, and not too well fed on proteins. In Holland and Denmark, cattle that once afforded milk, butter, and meat have been slaughtered for lack of forage, and once-well-fed populations stagnate on none-too-plentiful potatoes and other stuff lacking in sufficient protein and fat. "Guns rather than butter," was the Germans' choice, and they certainly produced an abundant crop of guns! For ourselves, as long as we could we took the other course. In 1941 the United States consumed some eleven million pounds of fats and oils (including lard, butter, etc.) and imported two billion pounds, mostly plant oils from the tropics. And from now on, from whatever sources we can get them, we are going to need still more for our own use, to say nothing of Lend-Lease. The American housewife must stop the huge fat-losses that clog the kitchen sink and leave the rancid odor in the garbage can. Also, we must produce more fats.

Of fats and oils—for reasons of space we must mention proteins only incidentally—there are plant sources aplenty. Someone has figured that about two-thirds of our higher plants store their seeds with oils as principal reserve foods. (For that matter, seeds rich in oils are usually rich in proteins too.) There is good sense in that; concentrated proteins are needed to start the living machine running, and bulk for bulk, or weight for weight, fats yield much more of its needed energy than either carbohydrates or proteins. But seeds generally are pretty small things, not too abundantly produced. Think of collecting a ton of foxglove or pansy seed for whatever might be in them!

So for practical purposes there are few really great oil-seeds. For American use, cottonseed and coconut lead the procession, and linseed, palm, soybean, tung, olive fruit, and a couple of dozen more come trailing along behind.

True oils (petroleum, as well as turpentine, clove oil and such belong in other categories) are compounds of glycerine and fatty acids. Glycerine is glycerine wherever found, but the fatty acids are varied; so, therefore, are the oils. And their uses are more varied still. Varied, also, are the proteins that remain in the press-cake after the oil is squeezed out. Residues of coconut, soybean, peanut, and many more can be eaten or fed to stock and are also valuable as nitrogenous fertilizer—something we rarely get too much of.

Some oils form a film when exposed to air; these are the drying oils, such as that of flaxseed or linseed. Drying oils lend their qualities to paints and varnishes, of which we need vast quantities for army cantonments and shipbuilding, and some for camouflage, to mention no other uses. Linseed oil stands far ahead in quantities used, although Chinese tung and perhaps East Indian perilla, which dry more rapidly and more durably, might beat it out could we get enough of them. Our own linseed output does not come from fiber flax, which is predominantly a slim, little-branched, humid-country plant. Rather it is machine-harvested from bushy varieties on hot summer lands of Minnesota and the Dakotas. California is also a producer. Throughout the depression, flaxseed was one domestic crop that was never in over-supply. In January, last, the Secretary of Agriculture set the goal for flax plantings 34 per cent above the acreage of 1941. Acreage actually seeded was 39 per cent above—94 per cent above the previous ten-year average. On July 1 last, harvest of 41,592,000 bushels of flaxseed was forecast.

In normal times, paint gets most of our linseed oil, linoleum gets some, and there are myriad other uses. If the ink on this page has none, some recent substitute must be pinch-hitting for it.

As a flaxseed producer, Argentina leads the world, supplying 80 per cent of the world's exports, including about half the needs of the United States. Huge war-bottled surpluses of Argentine flax and grains, which used to go to Europe, are in no small measure responsible for that country's difficult and somewhat equivocal position in the world crisis.

For tung, best of all quick-drying oils, we have depended almost wholly on China, although plantations of a promising experimental sort have been for some years in development in our Gulf Coast States. South Africa, also, is getting into the tung oil game. Oiticica, a Brazilian palm-oil reputedly as hard to use as to pronounce, has possibilities. Brazil, in fact, is a huge and scarcely yet exploited storehouse of oils. Could we get all the varied palm-oils whose sources grow in its vast, sparsely populated, and little explored hinterland, we should have few oil-necessities left to worry about. Some day the airplane will get these oils out. Much-publicized soybean oil has drying properties, and chemistry confers them on castor oil. Development of these oils ties in with still another chemical accomplishment—the manufacture from Southern pine stumps of gummy materials that combine with these ordinarily slow-drying oils to make paints and varnishes quick-setting as those made up of the disappearing Oriental tung.

As for castor oil, relatively little of this unpopular childhood acquaintance goes into medicine. Besides rapidly developing paint uses, large quantities go into finishing natural and artificial leather and into calico printing. Brazil sends in most of our castor seeds. In the first World War, we had poor luck getting this crop started in our South. We know more about castor seed raising by now, and perhaps can do better.

Paint, while a principal oil use, is exceeded by food demands and by soap-making. Domestic cottonseed is our great plant food-oil; best known when changed or hydrogenated into a lard-like solid. Soybean oil is coming up; so is corn oil, which is a by-product of starch manufacture. We have seen little lately of yesteryear's Italian olive oil. Some is pressed in California, but most California olives are pickled. Peanut oil, which we used to see only when it separated from the peanut butter, is the coming thing in food-oils. Peanuts from Dakar via Marseilles go through stricken France straight to Germany. In our own South farmers have been urged: "All out production of peanuts! Plant five million acres—255 per cent of last year's

(Continued on page 500)

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(Continued from page 498)

crop." This is by far the greatest "uppance" of any agricultural goal. Probably it is impossibly high. But every peanut will help. Elephants will get few of them this year.

Americans consume huge quantities of soap—and "soap opera." The fewer the washing machines, the more we need soap. Sudsy materials are still mostly made of fats, although new detergent chemicals bubble in washing powders. Years ago, glycerine was a by-product of soap-making; now, soap is more nearly a result of glycerine manufacture. At any rate, glycerine can be got from any fatty oil, but yields vary. More than 90 per cent of American glycerine issues from our soapworks. Sad as would be the wartime implication of "No soap!", "No glycerine" might be worse. Not that so much nitroglycerine is used directly to blast Germans and Italians and Japs. Some is, but more of it dislodges coal and iron ore and copper for war work; it comes in handy, too, for demolition when the earth has to be scorched.

In the soap-and-glycerine game the Japs really did something to us. Coconuts, dried into copra, and coconut oil were our major oil imports. They came almost wholly from the Philippines; some from British Oceania and the Netherlands East Indies. Something like 700,000,000 pounds a year are gone —just like that! And that is not the whole story; the British lost great quantities too.

Coconut oil is great stuff for frothy soaps that do their stuff even in hard water. It affords also some 14 per cent glycerine where other oils generally run from ten to eleven. Once-contented California cows moo mournfully for the rich coconut press-cake that is no more, while their owners hustle for substitutes—grape pomace from wineries, for one—raise the price of milk, and still, they say, lose money.

Palm-oil is also missed in the soap trade. It was valued, too, in putting a semi-permanent shine on tin plate. There are palm-oils and palm-oils, but to the oil trade the term means originally an African product of which the Netherlands Indies had become our chief supply-source. From that region alone we lost nearly 240,000,000 annual pounds.

Of course we shall do something about all this. No use planting coconuts, even in Florida. We shall saponify and glycerinize more cottonseed oil, and we shall raise more soybeans—9,000,000 acres, 154 per cent of the 1941 crop, we hope. (Out of deference to a possibly soybean-saturated public, further reference to the crop that incited the Japanese irruption into Manchuria and, supposedly, powered the great German war-machine with *ersatz* sausage will here be omitted.) We shall search South American palm-forests and jungles for other palm products of curious vernacular naming—babassu, murumuru, tucum, and other greasy products that resemble coconut more or less, and which soapmakers have been using in lesser quantities for many years. We shall make out somehow; if we say "No soap" or "No glycerine", we shall be talking to the Axis; not to ourselves.

•

SIDNEY LANIER

(Continued from page 468)

Tolerant plains, that suffer the sea
and the rains and the sun,
Ye spread and span like a catholic man who hath mightily won
God out of knowledge and good
out of infinite pain
And sight out of blindness and
purity out of a stain.

This, I submit, is Nature poetry at its most meaningful. Surely the efficacy of Nature has nowhere been more memorably expressed, or with deeper feeling.

His faith in Nature stood him truly in good stead, for during most of his short life Lanier was ill in body. He lived and wrote under conditions that for most men would have blacked-out their spiritual sun, moon, and stars; but in December 1880 as he lay at the very door of death, wasted by tuberculosis, he could write:

I am strong with the strength of
my lord the Sun:
How dark, how dark soever the
race that must needs be run,
I am lit with the Sun.

The same revivifying power of Nature is also the subject of "A Ballad of Trees and the Master," one of Lanier's best known poems. The sun, the marshes, the live-oaks, the forest—these were the things that healed his spirit even if they could not heal his broken body, and his devotion to them took the form of songs that have gained him a sure place in the literature of his beloved South and of America.

If there is one attribute above all others that should recommend Sidney Lanier to Nature lovers, it is his great love of trees, and whenever in his poems he speaks of trees it is with tender eloquence. In more than one poem he has given us little forest rhapsodies; many persons, indeed, when they hear Lanier's name think of the live-oak ("glooms of the live-oaks, beautiful-braided"), for that is the tree that he most persistently praises. At Brunswick, Georgia, still stands the magnificent Lanier Oak, overlooking the "wide sea-marshes of Glynn," with a marble marker nearby in memory of the poet.

There have been many other fitting memorials to Sidney Lanier, and during this year of his centenary the occasion has been appropriately observed, especially at Johns Hopkins University, where Lanier served a time as lecturer in English literature, and at the Peabody Institute (also in Baltimore), where for six years he was flutist in the orchestra. On February 2 and 3, 1942, these institutions joined in a special celebration in honor of Lanier. As a further observance, the Johns Hopkins Press plans to issue this year a definitive edition of Lanier's works in nine volumes.

Several biographies of Lanier and critiques of his literary work have been published in the half-century since his death, so that there is ample material for studying his life and career. Our purpose in this little note has been simply to do him homage and to emphasize one phase of his work —the Nature poems—in the hope that some readers will this year reread his poems and discover for themselves his stature as an American Nature poet. Prof. Norman Foerster, in his book *Nature in American Literature*, closes his chapter on Lanier with this characterization: "A body broken with disease, an emotional life lofty but rampant, and a mind incapable of bringing into harmony the parts of his nature [though he did a better job of it than many]—such was his endowment. But he had also genuine imagination and a love of all lovely things, and he knew how to give shape, if not perfect shape, to his vision."

To Lanier there were two good and perfect things—music and Nature—and when for him they turned out to be the same, the result was poetry of a high order. The music of the marshes, the majestic colors of the sunrise, the rhythms of the waving corn and the clover-blooms, the song of the river, the murmurs of the forest and the sea —these were Nature's harmonies that stirred and soothed his poet's soul, and we today, while "ignorant armies clash by night," can be eternally grateful for his consummate articulateness.

DOORYARD DRAMA

By Henry Leighton

Drama in the miniature is being enacted all around us. The small "beasties" of our back yards are the players. A sharp observant eye, perhaps helped by a magnifier or a reading glass, gives us a ring-side seat for each performance.

One summer day I noticed that every few minutes a small wasp would swoop down over the flower-box carrying, underslung, a green bundle, and looking for all the world like a torpedo-carrying plane. The flights came in on regular schedule, each making a three point landing as if at an airport. Each, after circling around for a minute, found his or rather her goal, tore open the concealed entrance to a tunnel and carried her green bundle underground.

A little study revealed the plan. Some wasps were seen digging the holes, backing out with material, backing up a ramp of earth particles, dumping the new load at the far end of the ramp, and returning to the hole, vigorously scratching the dirt back up the ramp as they advanced. Each busy digger had such a hole, and with funny backing and scratching had built a well-formed ramp extending perhaps two inches up from the hole. Each worker is a Mrs. Digger Wasp, for Comstock says that Mr. Wasp had long since departed this life leaving all the work and responsibility to his spouse. The hole completed to her satisfaction, she now carefully scratches some dirt into the entrance till it is concealed, and flies off on a hunting expedition. She is partial to little green leaf hoppers. Finding one, she stings it till it is paralyzed, slings it under her abdomen, and flies back to the ramp. She scratches open the hole with her front feet, drops the sleeping baggage at the entrance, crawls in, turns around at some underground turntable, comes back and quickly drags the green bundle to its living tomb. How many such trips she makes I cannot say, but she stores away in her catacombs a huge store of the fresh but unconscious meat. At each trip she covers the hole, and at each return, with uncanny intuition, she finds it and uncovers it.

After a few days of such shopping expeditions, she lays her eggs in the underground food stores, and, very carefully now, completely levels off the whole area, packs down the earth, and leaves her work perfectly graded and camouflaged. Many wasps were at work, many holes were dug, and hundreds of leaf hoppers now lie entombed and awaiting the hatching of the wasp eggs. The young wasps will devour the paralyzed unfortunates and dig their way to daylight.

We are watching and awaiting the resurrection of the wasps. There will be no resurrection for the leaf hoppers.

Eastman Films

Eastman Motion Picture Films for Professional Use. Rochester, N. Y. 1942. Eastman Kodak Company. 80 pages. $2.00.

Packed into this book is about everything that anyone using Eastman 16mm. and 35mm. motion picture needs to know. It covers emulsion characteristics, filters, outline of processing, tropical use, physical characteristics and specifications. There is a supplement on the commercial use of the 16mm. Kodachrome film. Through graphs and charts details of processes and practices and instructions on use are presented in concise and effective fashion. Being of distinctly non-mathematical mind ourselves we are intimidated by the figures, but motion-picture enthusiasts among our friends have gone over the book and say that it is "tops." It certainly impressed us with the fact that doing a proper job with movies requires both the right tools and knowledge of how to get the best out of them. This book, we are assured, accomplishes that purpose.

Re Chiggers

While the chigger season is over in northern climes, another will come and we can record for posterity certain rhymed remarks re chiggers. They come to us from Harry E. Hunt, "Old Custom", Put-in-Bay, Ohio, who apparently collects chigger comments. The first is credited to William T. Benallack of Detroit, who writes:

It's a pleasure to visit Old Custom,
Though your shins with the sulphur you dust 'em.
For the gay, festive chigger
Is quick at the trigger.
When he bites you, you'll know it,
ding bust 'im.

Dr. Roberson of Utica, Michigan, feels deeply about the chigger, also, reducing it to the following jingle:

The nasty little chigger,
He isn't any bigger
Than the point of a very small pin;
But the lump that he raises,
It itches like blazes,
And that's where the rub comes in.

This seems to take care of the chigger department for this issue.

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Under the Microscope

By JULIAN D. CORRINGTON

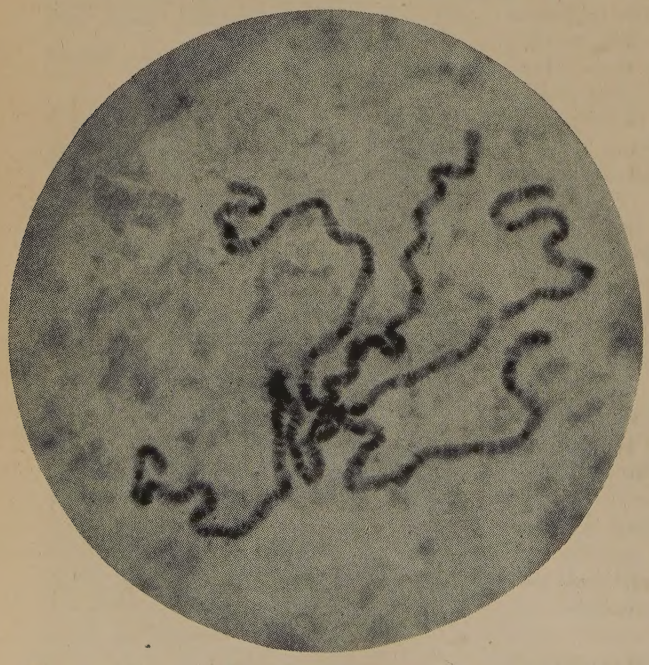
CHROMOSOMES

What is the most important substance in the universe? This sort of question is silly, of course, since no one element or compound can be considered more "important" than many another—yet the human mind enjoys speculations of this type. The chemist might answer "oxygen", the physicist "electricity", the geologist "water", the biologist "protoplasm." All are fundamental, but each one is functionless alone; the universe endures through action, interaction, and reaction of countless important substances.

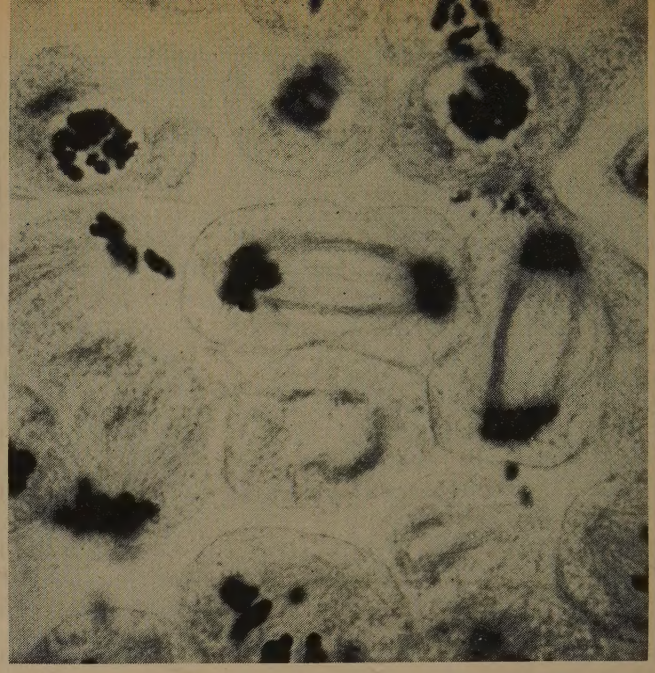
From the human point of view, however, certainly no thing is more important than the chromosome. Yet these bodies were not discovered until the early 1880's, and their full significance remained unrealized until well into the present century. Cytology (cell study), that very modern daughter of the biological family, devotes some eighty percent of its attention to chromosomes. They occur in all complete cells of every part of the body of all plants and animals above the simplest unicellular forms, as bacteria and amœba, beginning their evolutionary appearance in the higher algae and protozoa.

Chromosomes (color bodies) should have received some other name, indicative of their paramount function, yet were so-called merely because they exhibited a strong affinity for certain then newly-discovered coal-tar dyes. Safranin, for example, stains them intensely. Chromosomes may be spherical or oval, but are typically elongate, flexible sausages in shape. They are aggregations of chromatin granules, presumably the fundamental building blocks, and observable in bacteria and amœba, which lack the larger body.

Not present as such in resting cells, the chromosomes make their appearance only at times of cell reproduction by mitosis. In the interkinetic or resting phase, the substance of the chromosomes is dispersed throughout the nucleus of the cell in the form of chromatin granules, discrete particles lying upon extremely fine threads, the linin fibers, that criss-cross as a complex network within the nuclear membrane, the whole suspended in a clear, homogeneous nuclear sap. The granules tend to occur mostly at intersections of the fibers. When mitosis begins the granules aggregate to form a mass of intricately coiled threads, the spireme (drawing, A), from which the performance derives its name (mitosis, thread-process).



Giant salivary gland chromosomes, *Drosophila* larva, greatly magnified.

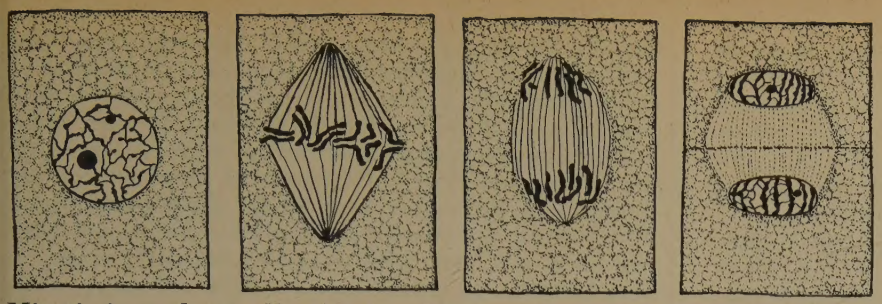


Mitotic figures in grasshopper spermary, greatly magnified. Metaphases at bottom, telophases center, prophases at top.

The spireme condenses and segments into chromosomes, always the same number and each with its particular individuality in any normal cell of a given species. Thus man has 48 chromosomes, *Drosophila* 8, the squash bug 21 in males, 22 in females. Further, such a set is actually a double or diploid one: the fertilized egg, from which all adult cells are derived by innumerable mitoses, having received one complement from the mother and one from the father. An expert can arrange the 48 chromosomes of man into 24 pairs. The two members of a pair are alike, but each of the 24 members of a set show some slight difference as to size or shape.

In studying mitosis it has been found convenient to divide the entire procedure into several phases, but it must be kept in mind that the process is absolutely continuous. Observing various fixed and stained cells at random under the microscope, then patching together a picture of cell division, may be compared to looking at the Mississippi River at St. Louis, New Orleans, Minneapolis, and Memphis, in that order, then trying to write a complete description of Old Man River as an entity. The stained cells present still pictures of instantaneous exposures of a complex, continuous event that may require thirty minutes for its completion. However, exhaustive studies of excellent material, supplemented by observation and even motion photomicrography of mitosis in living cells, have made it certain that our standard explanations of karyokinesis (another term for mitosis) are correct.

The events thus far described constitute the prophase (see drawing, A). While the chromosomes have been forming, the centriole, a minute and densely



Mitosis in a plant cell. (A) Prophase; nucleus with spireme threads. (B) Metaphase; chromosomes on equatorial plate, divided; spindle prominent. (C) Anaphase. (D) Telophase; new cell wall forming.

staining body lying near the nucleus in animal cells has divided, or is already divided in the interphase (resting stage). The two centrioles move apart and each develops a number of very fine radiating rays, termed astral rays from their resemblance to the conventional representation of a star. The centriole plus its rays is called an aster. Between the two asters there appears a fusiform or barrel-shaped body, the spindle, visible in fixed material as a series of fine spindle fibers, as if the two centrioles, in moving apart, drew out viscous threads between them. The two asters with the intervening spindle constitute the amphiaster. Minus the deeply staining centrioles, the amphiaster makes up the achromatic (colorless) figure, while the chromosomes and centrioles comprise the chromatic figure; all together form a mitotic figure.

Centrioles are not present in higher plants (drawing, B). Instead, the spindle fibers proceed from a polar cap of dense protoplasm, one at each pole of the nucleus. The spindle is not as prominent in plants as in animals.

At the end of the prophase the chromosomes arrange themselves in an equatorial plate, across the middle and at right angles to the spindle, hence they are best seen in cross sections of such cells. The nuclear membrane and one or more nucleoli have disappeared, the nuclear sap being now continuous with the cytoplasm. In the metaphase (drawing, B), the chromosomes split longitudinally, doubling their number. Actually, the spireme thread, when first formed in the prophase, is double, but this is often difficult to observe and the split frequently becomes apparent only with the so-called division of the chromosomes on the equatorial plate. This means that the real increase and doubling of the chromatic material takes place when this substance is in the form of scattered granules in the interphase, the complicated procedure of mitosis being necessary to *distribute* the material properly to two daughter cells, so that each receives exactly the same amount, quantitatively and qualitatively.

In the anaphase (C), the daughter chromosomes pass to their respective poles. An inner zone of spindle fibers, termed the chromosomal or traction fibers, are seen to extend from a centriole to a chromosome, where they are fastened, often by wrapping around. The outer, continuous spindle fibers, which are not attached to chromosomes but pass clear across the field from one centriole to the other, are called mantle fibers, and possibly serve to limit chromosome movements. Some believe that the passage of chromosomes to the poles is due to contraction of the traction fibers, mechanically pulling the chromosomes, but this has not been proved. When the chromosomes have reached their respective poles, the entire design is termed the diaster.

The final act is the telophase (D), in which the chromosomes begin to disintegrate, passing back into a reticulum of chromatin granules. A nuclear wall forms around each polar group, nucleoli reappear, and the cytoplasm divides to form two complete and separate cells. Obviously, the important material concerned in this elaborate scheme of division is the chromatin; otherwise the cell would merely pinch in two, as with amitosis in the simplest forms of life. After these points were thoroughly worked out it became necessary to explain why it was so essential to divide the chromatin thus exactly.

The reason was not far to seek, since the seemingly unrelated science of genetics had been unfolding in a parallel series of researches at about the same time. With the rediscovery in 1900 of Mendel's laws, buried in obscurity for 34 years, cytology provided exactly the mechanism required to explain the results of plant and animal breeding experiments. For example, if a black guinea pig is mated to a white one, the offspring are all black, but when two of these hybrids are crossed the second gen-

Background for the Microscope

Equipment for the pursuit of microscopy may be as simple or as elaborate as individual inclinations dictate; but there is one item wholly indispensable —*books!* The microscope is handmaiden to all the sciences, and those who follow its adventuresome trail must have many a guide to direct along the right path.

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eration progeny appear in a ratio of three black to one white. Mendelian terminology called black, in this case, dominant, white recessive, and demanded some sort of determiner for body color to be present in the germ cells. We call such determiners genes today, and mitosis, among many other evidences, proves that the genes must reside in the chromosomes.

When the germ cells—the sperms and eggs respectively—undergo their last series of mitotic divisions before becoming fully mature and functional gametes (sex cells), they exhibit one mitosis each in which the chromosomes do not split and double their number. Rather, half of those already present pass to one pole and the other half to the other pole, making two daughter cells whose equipment includes but half the normal number of chromosomes, called the haploid number. This peculiar division is designated as meiosis, to provide a distinctive name; it is also known as the reduction division. Detailed studies have shown that in this meiosis the chromosomes line up on the equatorial plate in pairs, one member of each of which was originally derived from the father, one from the mother. All body cells are diploid and contain two full sets of chromosomes; the germ cells are haploid and have but one set.

This phenomenon explains Mendel's law of segregation, or purity of the gametes. The black guinea pig, if purebred, may be represented by the symbols WW, meaning that it has two determiners for black, one from each of its parents; the white animal, similarly, is ww. The initial letter (w) of the most recent of the two contrasting characters (white, in this case) is chosen; capital letter for dominant (W=black), lower case for recessive (w=white). Every body cell of the black parent, whether from the cornea of the eye, a white blood corpuscle, nerve cell, or in the lining of the stomach, would contain a pair of chromosomes with these same genes, WW. The mature germ cells, however, would have only one chromosome of this pair, with only one W. The W's do not divide and double their number in the metaphase of the reduction division, but merely separate from each other, the daughter cell receiving but one gene for this character. Similarly, the mature gamete of the other parent would have but one w. Mendel, not knowing these cytological facts, nevertheless observed from his breeding results that the gametes must be "pure" (haploid) for a given character, and that the two members of a diploid pair, such as WW, must segregate from one another in some manner.

Upon fertilization of the egg by the sperm, the one introduces W and the other w, the zygote or fertilized egg thus having Ww. Either parent is homozygous (like gametes; WW or ww) or purebred, but the offspring are heterozygous (unlike gametes, Ww) or hybrid.

Now when two of these hybrids are crossed, there will be two kinds of sperms and two kinds of eggs, because of segregation in the reduction division. Half the sperms will carry gene W, the other half gene w; and so with the eggs. Fertilizations for the second generation, occuring at random, provide four possibilities; a W sperm may fertilize a W egg; likewise it may just as often unite with a w egg. Also a w sperm will join with either a W or w egg. The four resulting combinations, in equal numbers, are WW, Ww, wW and ww. The first three of these are black because W is dominant to w, but the last individual (ww) is white.

Mitosis and its modification, meiosis, are essential to explain the actual results obtained by crossing animals and plants that differ by one or more of these unit characters. If a normal man (FF) marries a feebleminded woman (ff), the offspring (Ff) will all be normal since normal mind is dominant. But these children carry the latent and dangerous recessive gene (f)—hence the geneticist terms them carriers—and when two such marry, utterly ignorant, in most cases, of their heritage, one out of four of their children will be feebleminded (ff). Hundreds of human traits are known to be hereditary, and so our chromosomes bear the determiners of what we shall become. Genes have not been seen, even with the powerful electron microscope, yet their existence is as certain and amply demonstrated, through a vast array of experimental evidence, as that of atoms and electrons. Chromosomes, the bearers of hereditary characters, are the most important structures in the organic world.

Oh chromosome, oh chromosome
How fateful is thy mission!
Oh chromosome, oh chromosome
How sad is my condition.
My grandsire's gift of writing well
Has gone to some lost polar cell.
And so I write this doggerel,
I cannot do much better. —ANNA E. BLOUNT

BOOK REVIEWS

In connection with the principal subject of our Department this month, our book reviews will concern themselves with the science of genetics. Also, next month this Department will discuss techniques. One of the best known standard introductory texts, now in its fourth edition, is *Genetics,* by that engaging writer, Professor H. E. Walter, Brown University. After an introduction, five avenues of approach to the problems of heredity are detailed—observational, experimental, statistical, cytological, and developmental, followed by the applications to man in the fields of eugenics and euthenics. The coverage is thorough, without going so deeply into advanced studies as to get over the ears of the beginning student. The style and language capture the interest, and there are problems for practice and appendices with extracurricular activities. The adult working alone may teach himself modern genetics by reading this volume and working out the practice problems as he progresses. Pp. xvii, 412; figs. 150. The Macmillan Co., 60 Fifth Ave., New York, 1938. $3.00.

Somewhat more advanced and technical, but designed for the beginning college course in genetics is *The Principles of Heredity,* by Professor L. H. Snyder, Ohio State University, now in its 2d edition. There is less introductory or historical material, but greater detail, more advanced topics and more problems. For those who have had an introductory college course in general biology, or the equivalent, and understand generalities, at least, in heredity, this is a most engaging, stimulating, and thought-provoking work, very well organized and illustrated. Pp. 467. D. C. Heath & Co., 180 Varick St., New York, 1940. $3.50.

Professor Nathan Fasten, of Oregon State College, in his *Principles of Genetics and Eugenics,* covers a wider territory than in either of the foregoing. Forsaking the customary method of presentation, the author takes up evolutionary and heredity theories, cytology, embryology, sex determination and many other matters first, and does not arrive at simple Mendelian crosses until the tenth chapter. The final four chapters cover eugenics and provide fuller treatment and more illustrations for this important division than in other texts. No problems are included. This book gives less detail in genetics proper, but greater integration with all allied subjects. It is well suited to the beginning student or the individual working without supervision. Pp. viii, 407; figs. 120; glossary, bibliography. Ginn & Co., 70 Fifth Ave., New York, 1935. $2.80.